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MEASUREMENT REPORT
FCC PART 15.407

Applicant Name:
Samsung Electronics Co., Ltd.
129, Samsung-ro,
Yeongtong-gu, Suwon-si
Gyeonggi-do, 16677, Korea

Date of Testing:
09/02/2022 – 02/24/2023
Test Report Issue Date:
02/24/2023
Test Site/Location:
Element lab., Columbia, MD, USA
Test Report Serial No.:
1M2212080136-11-R1.A3L

FCC ID:	**A3LSMS911JPN**
APPLICANT:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
Model(s):	SC-51D, SCG19
EUT Type:	Portable Handset
Frequency Range:	5180 – 5885MHz
Modulation Type:	OFDMA
FCC Equipment Class:	Unlicensed National Information Infrastructure TX (NII)
FCC Rule Part(s):	Part 15 Subpart E (15.407)
Test Procedure(s):	ANSI C63.10-2013, KDB 789033 D02 v02r01, KDB 291074 D02 v01, KDB 648474 D03 v01r04, KDB 662911 D01 v02r01

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.10-2013 and KDB 789033 D02 v02r01. Test results reported herein relate only to the item(s) tested.

Note: This revised Test Report (S/N: 1M2212080136-11-R1.A3L) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

RJ Ortanez
Executive Vice President

ACCREDITED
CERT #2041.01

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UNII Band	Channel Bandwidth (MHz)	Tx Frequency (MHz)	MIMO	
			Max. Power (mW)	Max. Power (dBm)
1	20	5180 - 5240	57.943	17.63
2A		5260 - 5320	114.288	20.58
2C		5500 - 5720	122.462	20.88
3		5745 - 5825	117.220	20.69
4		5845 - 5885	99.312	19.97
1	40	5190 - 5230	125.026	20.97
2A		5270 - 5310	114.815	20.60
2C		5510 - 5710	123.880	20.93
3		5755 - 5795	119.399	20.77
4		5835 - 5875	98.628	19.94
1	80	5210	54.576	17.37
2A		5290	55.847	17.47
2C		5530 - 5690	120.226	20.80
3		5775	68.391	18.35
4		5855	100.000	20.00
1/2A	160	5250	54.576	17.37
2C		5570	70.146	18.46
4		5815	107.399	20.31

EUT Overview

Note: The UNII Band 4 max power values shown in the above table are e.i.r.p values.

1.0 INTRODUCTION

1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Innovation, Science and Economic Development Canada.

1.2 Element Test Location

These measurement tests were conducted at the Element laboratory located at 7185 Oakland Mills Road, Columbia, MD 21046. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

1.3 Test Facility / Accreditations

Measurements were performed at Element lab located in Columbia, MD 21046, U.S.A.

- Element Washington DC LLC is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.

- Element Washington DC LLC TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).

- Element Washington DC LLC facility is a registered (2451B) test laboratory with the site description on file with ISED.

- Element Washington DC LLC is a Recognized U.S. Certification Assessment Body (CAB # US0110) for ISED Canada as designated by NIST under the U.S. and Canada Mutual Recognition Agreements (MRAs).

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMS911JPN**. The test data contained in this report pertains only to the emissions due to the EUT's UNII transmitter.

Test Device Serial No.: 0262M, 0280M, 0219M, 0210M, 0232M

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850 WCDMA/HSPA, Multi-band LTE, Multi-band 5G NR (FR1), 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII (5GHz and 6GHz), Bluetooth (1x, EDR, LE), NFC, Wireless Power Transfer

Band 1		Band 2A		Band 2C		Band 3		Band 3/4	
Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
36	5180	52	5260	100	5500	149	5745	169	5845
:	:	:	:	:	:	:	:	:	:
40	5200	56	5280	120	5600	157	5785	173	5865
:	:	:	:	:	:	:	:	:	:
48	5240	64	5320	144	5720	165	5825	177	5885

Table 2-1. 802.11ax (20MHz) Frequency / Channel Operations

Band 1		Band 2A		Band 2C		Band 3		Band 3/4	
Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
38	5190	54	5270	102	5510	151	5755	167	5835
:	:	:	:	:	:	:	:	:	:
46	5230	62	5310	118	5590	159	5795	175	5875
				:	:				
				142	5710				

Table 2-2. 802.11ax (40MHz BW) Frequency / Channel Operations

Band 1		Band 2A		Band 2C		Band 3		Band 3/4	
Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
42	5210	58	5290	106	5530	155	5775	167	5835
				:	:				
				122	5610				
				:	:				
				138	5690				

Table 2-3. 802.11ax (80MHz BW) Frequency / Channel Operations

Band 1/2A		Band 2C		Band 3/4	
Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
50	5250	114	5570	163	5815

Table 2-4. 802.11ax (160MHz BW) Frequency / Channel Operations

Notes:

1. 5GHz NII operation is possible in 20MHz, and 40MHz, 80MHz, and 160MHz channel bandwidths. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8MHz, VBW = 50MHz, and detector = peak per the guidance of Section B)2)b) of ANSI C63.10-2013 and KDB 789033 D02 v02r01. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was greater than 100. The duty cycles are as follows:

Mode	Antenna	Bandwidth [MHz]	Tone	Duty Cycle
802.11ax NII RU	MIMO CDD	20	26T	99.3
			52T	99.3
			106T	98.8
			242T	98.6
802.11ax NII RU	MIMO CDD	40	26T	99.2
			52T	99.3
			106T	98.8
			242T	98.6
			484T	98.6
802.11ax NII RU	MIMO CDD	80	26T	99.3
			52T	99.3
			106T	98.8
			242T	98.6
			484T	98.6
			996T	98.5
802.11ax NII RU	MIMO CDD	160 1st	26T	99.3
			52T	99.2
			106T	98.8
			242T	98.6
			484T	98.5
			996T	98.5
802.11ax NII RU	MIMO CDD	160 2nd	26T	99.3
			52T	99.3
			106T	98.8
			242T	98.6
			484T	98.6
			996T	98.5
802.11ax NII RU NII RU	MIMO CDD	160 Full	996*2T	99.7

Table 2-5. Measured Duty Cycles

2. The device employs MIMO technology. Below are the possible configurations.

WiFi Configurations		SISO		SDM		CDD	
		ANT1	ANT2	ANT1	ANT2	ANT1	ANT2
5GHz	11ax (20MHz)	×	×	✓	✓	✓	✓
	11ax (40MHz)	×	×	✓	✓	✓	✓
	11ax (80MHz)	×	×	✓	✓	✓	✓
	11ax (160MHz)	×	×	✓	✓	✓	✓

Table 2-6. Frequency / Channel Operations

✓= Support ; × = NOT Support
SISO = Single Input Single Output
SDM = Spatial Diversity Multiplexing – MIMO function

3. This device supports simultaneous transmission operation, which allows for two SISO channels to operate independent of one another in the 2.4GHz (WLAN & BT) and 5GHz bands simultaneously on each antenna. The following tables show the worst case configurations determined during testing. The data for these configurations is contained in this test report. The BT + 5GHz case is not considered as worst case since the BT power is lower than the 2.4GHz WLAN power.

Configuration 1: ANT1 and ANT2 both transmitting in 2.4GHz and 5GHz modes simultaneously

Description	2.4 GHz Emission	5 GHz Emission
Antenna	1, 2	1, 2
Channel	11	120
Operating Frequency (MHz)	2462	5600
Data Rate (Mbps)	1Mbps	6Mbps
Mode	802.11b	802.11a

Table 2-7. Config-1 (MIMO 2.4GHz & MIMO 5GHz)

Configuration 2: ANT1 and ANT2 both transmitting in 2.4GHz and 6GHz modes simultaneously

Description	2.4 GHz Emission	6 GHz Emission
Antenna	1, 2	1, 2
Channel	6	25
Operating Frequency (MHz)	2437	6075
Data Rate (Mbps)	1Mbps	6Mbps
Mode	802.11b	802.11a

Table 2-8. Config-2 (MIMO 2.4GHz & MIMO 6GHz)

2.3 Antenna Description

Following antenna was used for the testing.

Frequency [GHz]	Antenna 1 Gain [dBi]	Antenna 2 Gain [dBi]	Directional Ant. Gain [dBi]
5.20	-5.07	-3.05	-0.99
5.30	-3.14	-2.12	0.40
5.50	-2.69	-5.11	-0.81
5.80	-2.32	-5.07	-0.58
5.85	-3.14	-4.77	-0.91

Table 2-9. Antenna Peak Gain

2.4 Test Configuration

The EUT was tested per the guidance of KDB 789033 D02 v02r01. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing.

This device supports wireless charging capability and, thus, is subject to the test requirements of KDB 648474 D03 v01r04. Additional radiated spurious emission measurements were performed with the EUT lying flat on an authorized wireless charging pad (WCP) Model: EP-N5100 while operating under normal conditions in a simulated call or data transmission configuration. The worst case radiated emissions data is shown in this report.

2.5 Software and Firmware

The test was conducted with software/firmware version S911USQU0AVJM installed on the EUT.

2.6 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedures described in the American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices (ANSI C63.10-2013) and the guidance provided in KDB 789033 D02 v02r01 and KDB 291074 Do2 v01 were used in the measurement of the EUT**.**

Deviation from measurement procedure……..…….....None

3.2 Radiated Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4-2014. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. An 80cm tall test table made of Styrodur is placed on top of the turn table. For measurements above 1GHz, an additional Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

For all measurements, the spectrum was scanned through all EUT azimuths and from 1 to 4 meter receive antenna height using a broadband antenna from 30MHz up to the upper frequency shown in 15.33 depending on the highest frequency generated or used in the device or on which the device operates or tunes. For frequencies above 1GHz, linearly polarized double ridge horn antennas were used. For frequencies below 30MHz, a calibrated loop antenna was used. When exploratory measurements were necessary, they were performed at 1 meter test distance inside the semi-anechoic chamber using broadband antennas, broadband amplifiers, and spectrum analyzers to determine the frequencies and modes producing the maximum emissions. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The test set-up was placed on top of the 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth, and receive antenna height was noted for each frequency found.

Final measurements were made in the semi-anechoic chamber using calibrated, linearly polarized broadband and horn antennas. The test setup was configured to the setup that produced the worst case emissions. The spectrum analyzer was set to investigate all frequencies required for testing to compare the highest radiated disturbances with respect to the specified limits. The turntable containing the EUT was rotated through 360 degrees and the height of the receive antenna was varied 1 to 4 meters and stopped at the azimuth and height producing the maximum emission. Each emission was maximized by changing the orientation of the EUT through three orthogonal planes and changing the polarity of the receive antenna, whichever produced the worst-case emissions.

All radiated measurements are performed in a chamber that meets the site requirements per ANSI C63.4-2014. Additionally, radiated emissions below 30MHz are also validated on an Open Area Test Site to assert correlation with the chamber measurements per the requirements of KDB 414788 D01 v01r01.

3.3 Environmental Conditions

The temperature is controlled within range of 15ºC to 35ºC. The relative humidity is controlled within range of 10% to 75%. The atmospheric pressure is monitored within the range 86-106kPa (860-1060mbar).

4.0 ANTENNA REQUIREMENTS

Excerpt from §15.203 of the FCC Rules/Regulations:
"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

- The antennas of the EUT are **permanently attached.**
- There are no provisions for connection to an external antenna.

Conclusion:

The EUT complies with the requirement of §15.203.

5.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013. All measurement uncertainty values are shown with a coverage factor of k = 2 to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty (±dB)
Conducted Bench Top Measurements	1.13
Line Conducted Disturbance	3.09
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

6.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	ETS-001	EMC Cable and Switch System	8/11/2022	Annual	8/11/2023	ETS-001
-	ETS-002	EMC Cable and Switch System	8/11/2022	Annual	8/11/2023	ETS-002
-	AP2-001	EMC Cable and Switch System	8/11/2022	Annual	8/11/2023	AP2-001
-	AP2-002	EMC Cable and Switch System	8/11/2022	Annual	8/11/2023	AP2-002
-	WL25-1	Conducted Cable Set (25GHz)	7/29/2022	Annual	7/29/2023	WL25-1
-	WL25-2	Conducted Cable Set (25GHz)	7/29/2022	Annual	7/29/2023	WL25-2
-	WL25-3	Conducted Cable Set (25GHz)	7/29/2022	Annual	7/29/2023	WL25-3
-	WL25-4	Conducted Cable Set (25GHz)	7/29/2022	Annual	7/29/2023	WL25-4
-	WL40-1	Conducted Cable Set (40GHz)	7/29/2022	Annual	7/29/2023	WL40-1
Agilent	N9038A	MXE EMI Receiver	1/21/2022	Annual	1/21/2023	MY51210133
Agilent	N9020A	MXA Signal Analyzer	3/4/2022	Annual	3/4/2023	US46470561
Agilent	N9030A	PXA Signal Analyzer (44GHz)	8/18/2022	Annual	8/18/2023	MY49430494
Anritsu	ML2495A	Power Meter	5/9/2022	Annual	5/9/2023	1328004
Anritsu	ML2495A	Power Meter	3/17/2022	Annual	3/17/2023	941001
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	4/13/2022	Biennial	4/13/2024	121034
Emco	3115	Horn Antenna (1-18GHz)	8/8/2022	Biennial	8/8/2024	9704-5182
Emco	3116	Horn Antenna (18 - 40GHz)	7/20/2021	Biennial	7/20/2023	9203-2178
ETS-Lindgren	3816/2NM	Line Impedance Stabilization Network	8/11/2022	Biennial	8/11/2024	114451
Keysight Technologies	N9030A	PXA Signal Analyzer (3Hz-26.5GHz)	9/6/2022	Annual	9/6/2023	MY54490576
Keysight Technologies	N9020A	MXA Signal Analyzer	3/15/2022	Annual	3/15/2023	MY54500644
Pasternack	NMLC-2	Line Conducted Emissions Cable (NM)	12/19/2021	Annual	12/19/2022	NMLC-2
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	8/29/2022	Annual	8/29/2023	100342
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	8/25/2022	Annual	8/25/2023	100348
Sunol	DRH-118	Horn Antenna (1-18GHz)	2/14/2022	Biennial	2/14/2024	A050307
Sunol	DRH-118	Horn Antenna (1-18 GHz)	1/14/2022	Biennial	1/14/2024	A042511
Sunol	JB6	Bi-Log Antenna (30M - 6GHz)	11/13/2020	Biennial	11/13/2022	A051107

Table 6-1. Annual Test Equipment Calibration Schedule

Note:

For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.
FCC ID: A3LSMS911JPN
FCC Classification: Unlicensed National Information Infrastructure (UNII)

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
N/A	26dB Bandwidth	N/A	CONDUCTED	PASS	Section 7.2
15.407(e)	6dB Bandwidth	>500kHz(5725-5850MHz)		PASS	Section 7.3
15.407 (a.1.iv), (a.2), (a.3)	Maximum Conducted Output Power	Maximum conducted powers must meet the limits detailed in 15.407 (a)		PASS	Section 7.4
15.407 (a.1.iv), (a.2), (a.3)	Maximum Power Spectral Density	Maximum power spectral density must meet the limits detailed in 15.407 (a)		PASS	Section 7.5
15.407(h)	Dynamic Frequency Selection	See DFS Test Report		PASS	See DFS Test Report
15.407(b.1), (2), (3), (4)	Undesirable Emissions	Undesirable emissions must meet the limits detailed in 15.407(b)	RADIATED	PASS	Section 7.6
15.205, 15.407(b.1), (4), (5), (6)	General Field Strength Limits (Restricted Bands and Radiated Emission Limits)	Emissions in restricted bands must meet the radiated limits detailed in 15.209		PASS	Section 7.6, 7.7

Table 7-1. Summary of Test Results

Notes:

1) All channels, modes, and modulations/data rates were investigated among all UNII bands. The test results shown in the following sections represent the worst case emissions.
2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.
4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is Element "UNII Automation," Version 4.7.
5) For radiated band edge, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is Element "Chamber Automation," Version 1.5.0.
6) 802.11ax OFDMA testing was performed for all signal tone configurations as specified by the 802.11ax standard. Worst case results are determined and reported per the guidance provided at the October 2018 TCB Workshop.
7) Only one RU index could be selected at a time, so no contiguous or non-contiguous RUs were considered for testing.

7.2 26dB Bandwidth Measurement – 802.11ax OFDMA

RSS-Gen [6.2]

Test Overview and Limit

The bandwidth at 26dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating at its maximum duty cycle, at its maximum power control level, as defined in ANSI C63.10-2013 and KDB 789033 D02 v02r01, and at the appropriate frequencies. The spectrum analyzer's bandwidth measurement function is configured to measure the 26dB bandwidth.

The 26dB bandwidth is used to determine the conducted power limits.

Test Procedure Used

ANSI C63.10-2013 – Section 12.4
KDB 789033 D02 v02r01 – Section C

Test Settings

1. The signal analyzers' automatic bandwidth measurement capability was used to perform the 26dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 26. The automatic bandwidth measurement function also has the capability of simultaneously measuring the 99% occupied bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = approximately 1% of the emission bandwidth
3. VBW $\geq$ 3 x RBW
4. Detector = Peak
5. Trace mode = max hold

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

Figure 7-1. Test Instrument & Measurement Setup

Test Notes

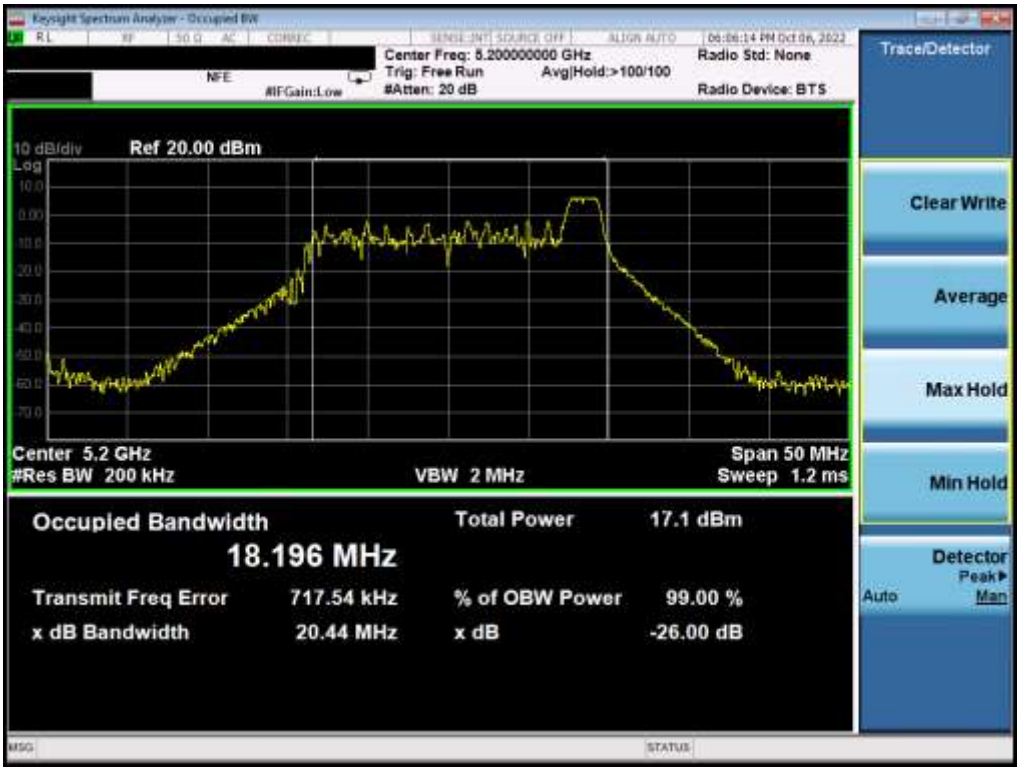
The 26dB Bandwidth measurement for each channel was measured with the RU index showing the highest conducted power.

MIMO Antenna-1 26 dB Bandwidth Measurements (26 Tones)

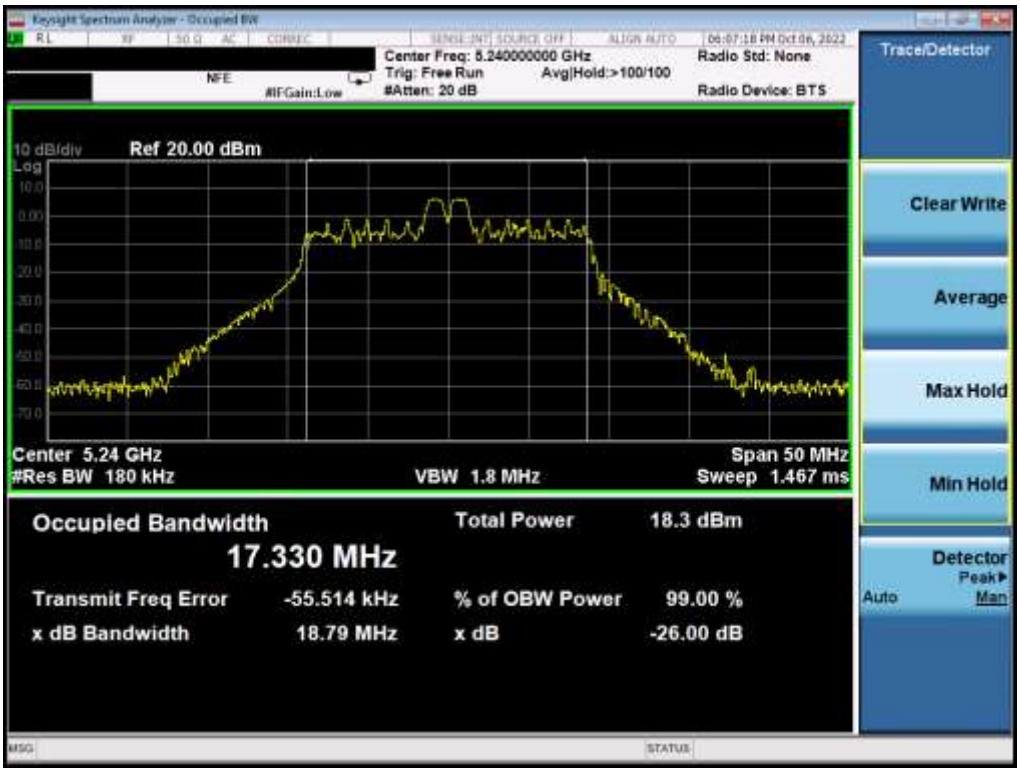
	Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	Measured 26dB Bandwidth [MHz]
Band 1	5180	36	ax (20MHz)	26T	MCS0	20.18
	5200	40	ax (20MHz)	26T	MCS0	20.44
	5240	48	ax (20MHz)	26T	MCS0	18.79
	5190	38	ax (40MHz)	26T	MCS0	40.37
	5230	46	ax (40MHz)	26T	MCS0	36.97
	5210	42	ax (80MHz)	26T	MCS0	82.10
Band 1/2A	5250	50	ax (160MHz L)	26T	MCS0	160.30
	5250	50	ax (160MHz U)	26T	MCS0	160.30
Band 2A	5260	52	ax (20MHz)	26T	MCS0	20.74
	5280	56	ax (20MHz)	26T	MCS0	20.42
	5320	64	ax (20MHz)	26T	MCS0	20.48
	5270	54	ax (40MHz)	26T	MCS0	37.98
	5310	62	ax (40MHz)	26T	MCS0	40.63
	5290	58	ax (80MHz)	26T	MCS0	82.33
Band 2C	5500	100	ax (20MHz)	26T	MCS0	18.82
	5600	120	ax (20MHz)	26T	MCS0	20.36
	5720	144	ax (20MHz)	26T	MCS0	20.59
	5510	102	ax (40MHz)	26T	MCS0	37.96
	5590	118	ax (40MHz)	26T	MCS0	41.24
	5710	142	ax (40MHz)	26T	MCS0	40.49
	5530	106	ax (80MHz)	26T	MCS0	81.66
	5610	122	ax (80MHz)	26T	MCS0	81.83
	5690	138	ax (80MHz)	26T	MCS0	82.50
	5570	114	ax (160MHz L)	26T	MCS0	158.00
	5570	114	ax (160MHz U)	26T	MCS0	156.30

Table 7-2. Conducted Bandwidth Measurements MIMO ANT1 (26 Tones)

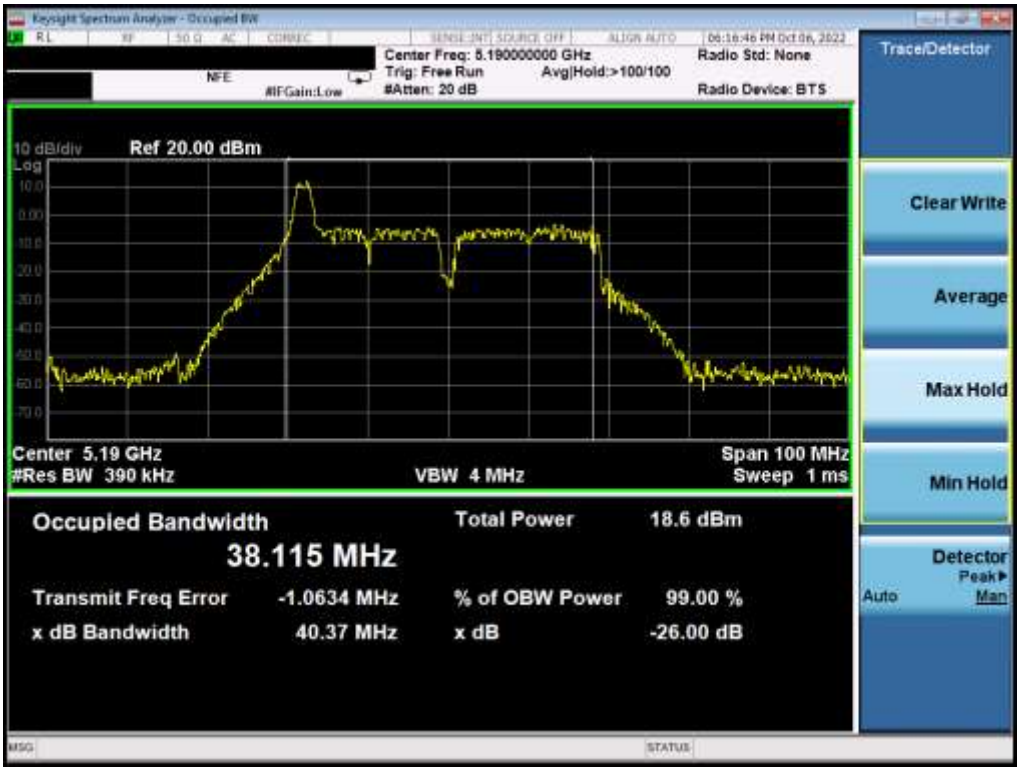
Plot 7-1. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 36)



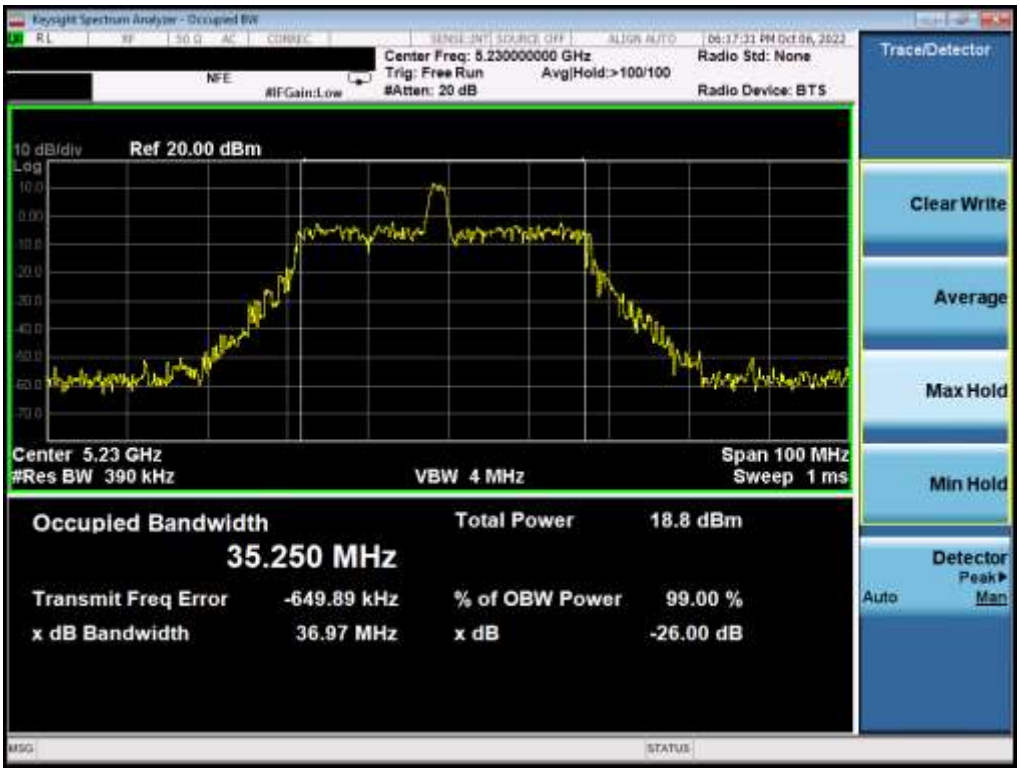
Plot 7-2. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 40)



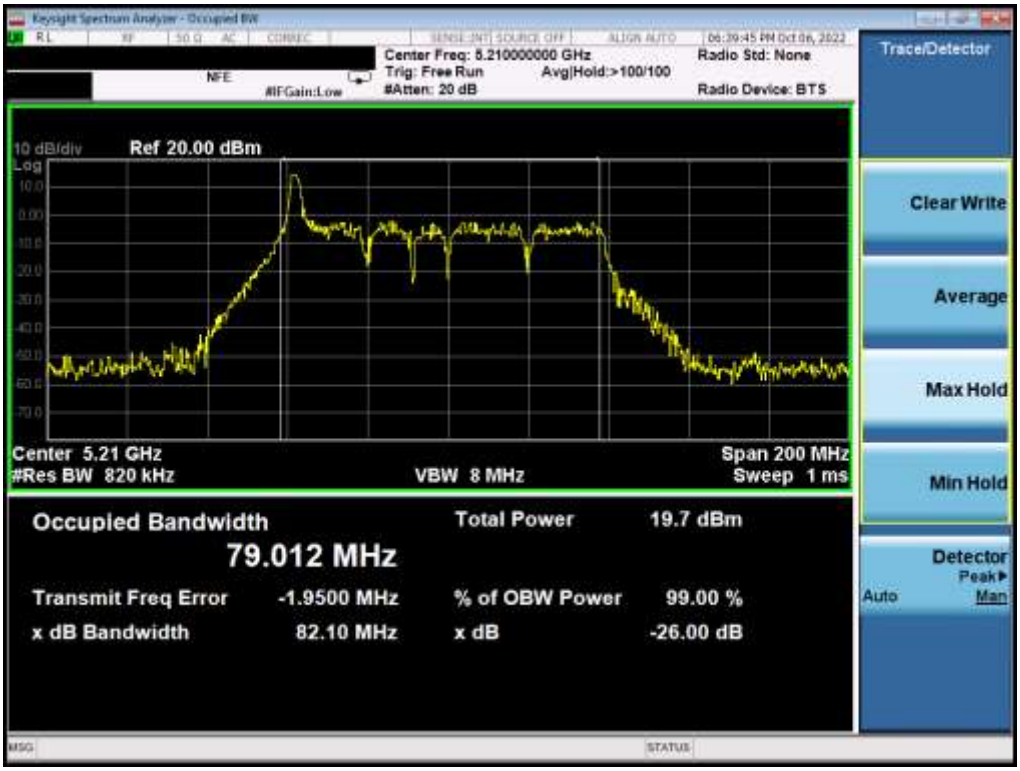
Plot 7-3. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 48)



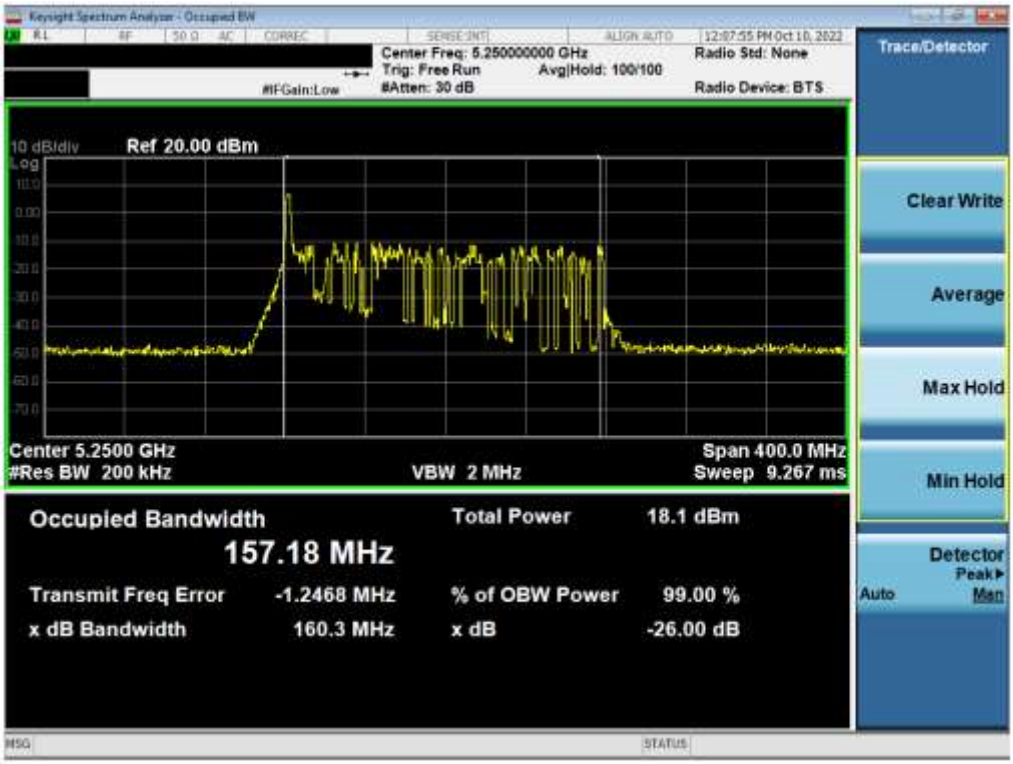
Plot 7-4. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 38)



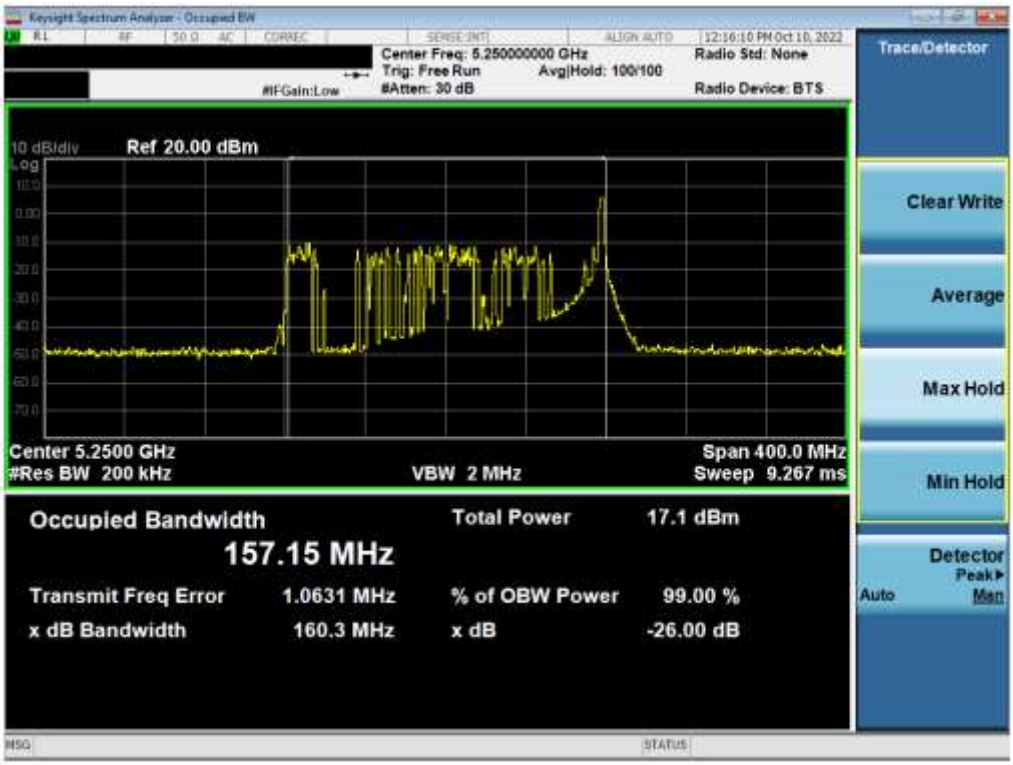
Plot 7-5. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 46)



Plot 7-6. 26dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 42)



Plot 7-7. 26dB Bandwidth Plot MIMO ANT1 (160MHz(L) BW 802.11ax – 26 Tones (UNII Band 1/2A) – Ch. 50)



Plot 7-8. 26dB Bandwidth Plot MIMO ANT1 (160MHz(U) BW 802.11ax – 26 Tones (UNII Band 1/2A) – Ch. 50)

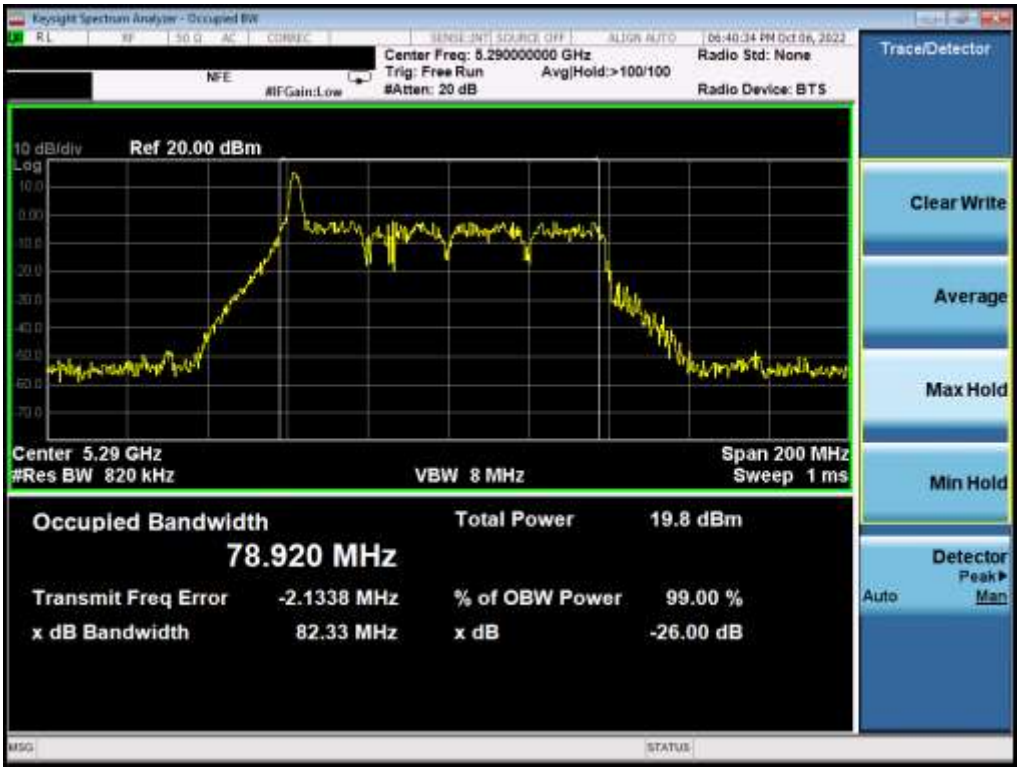
Plot 7-9. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 52)

Plot 7-10. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 56)

Plot 7-11. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 64)

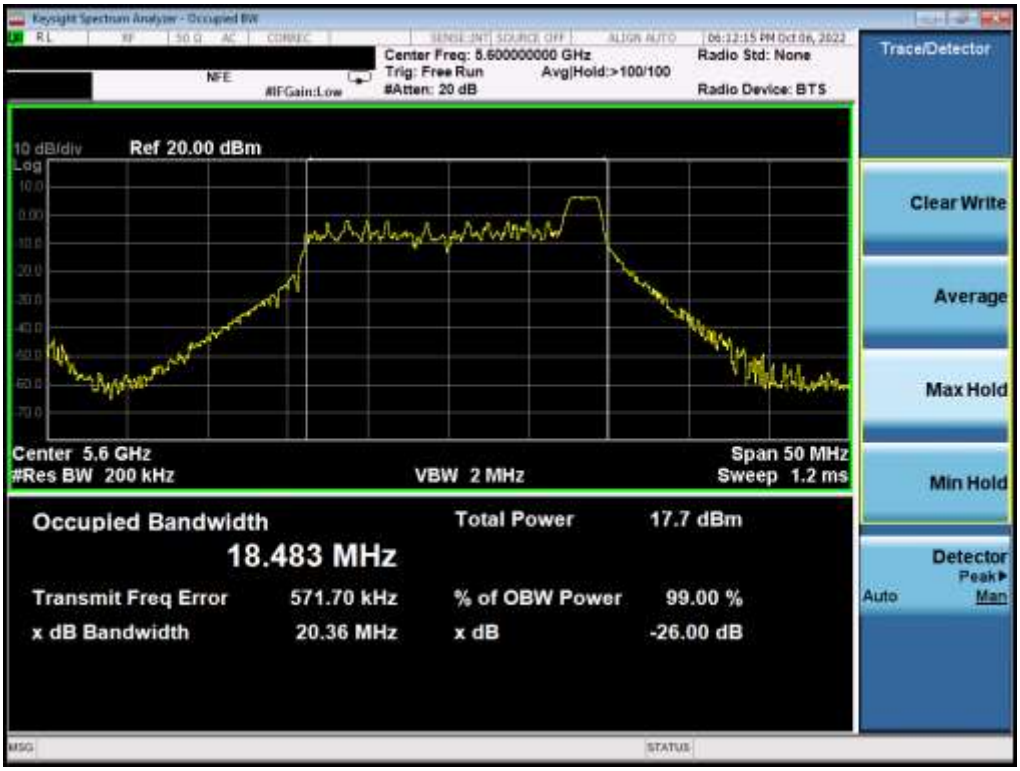
Plot 7-12. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 54)

Plot 7-13. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 62)

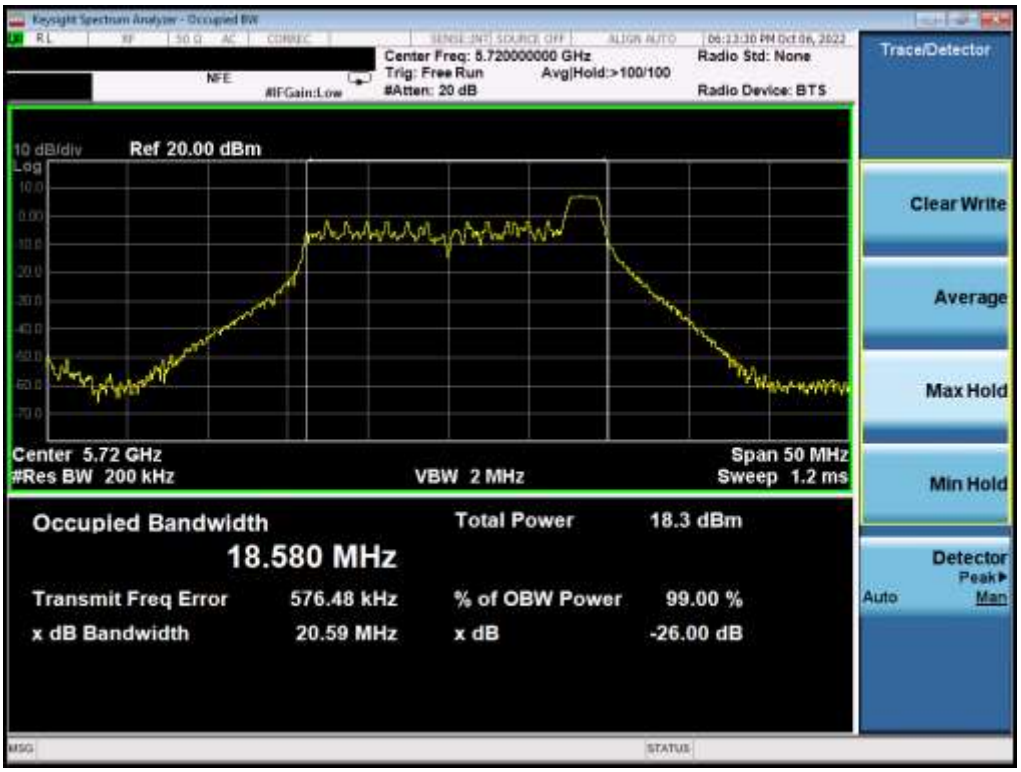


Plot 7-14. 26dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 58)

Plot 7-15. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 100)



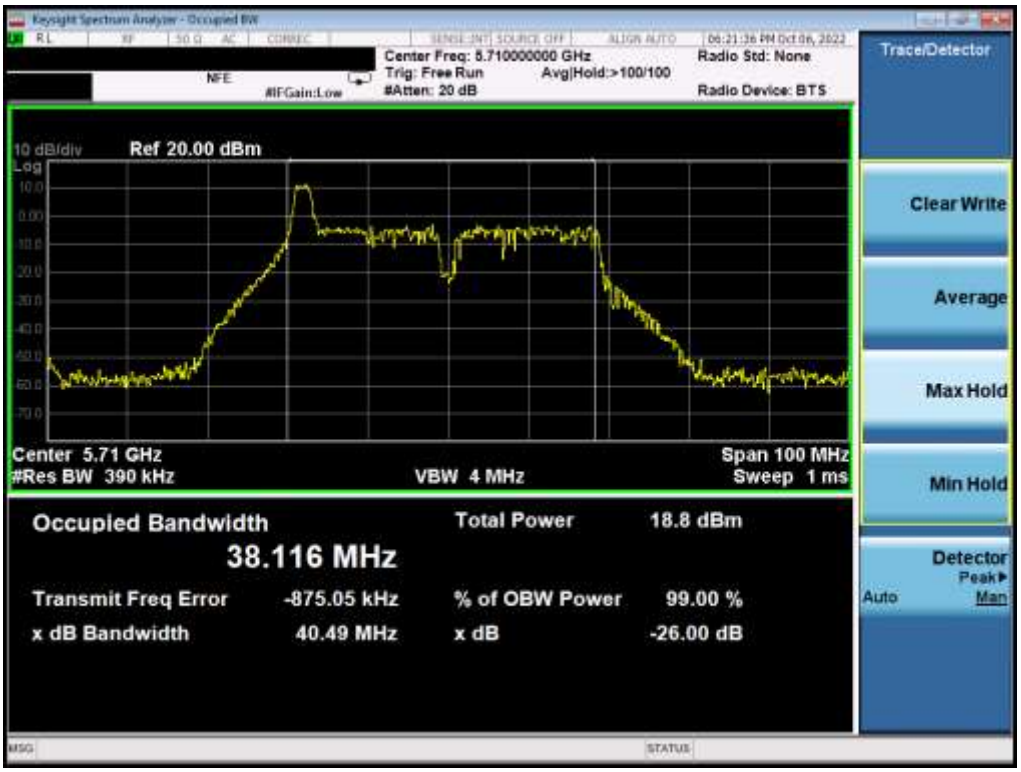
Plot 7-16. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 120)



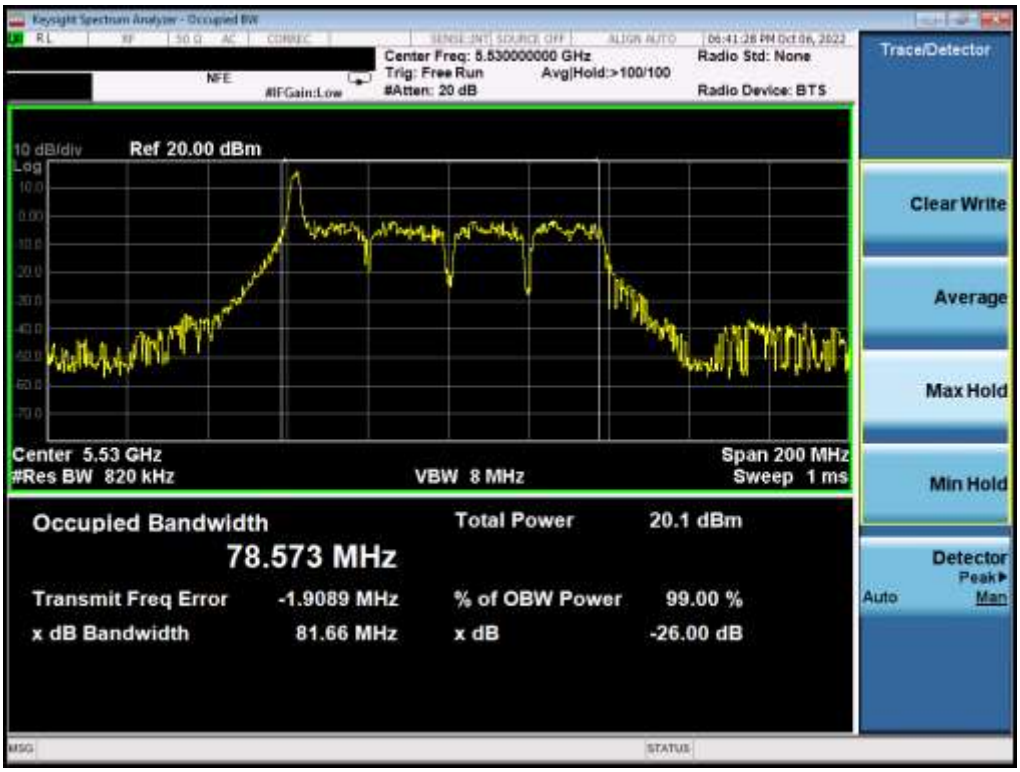
Plot 7-17. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 144)

Plot 7-18. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 102)

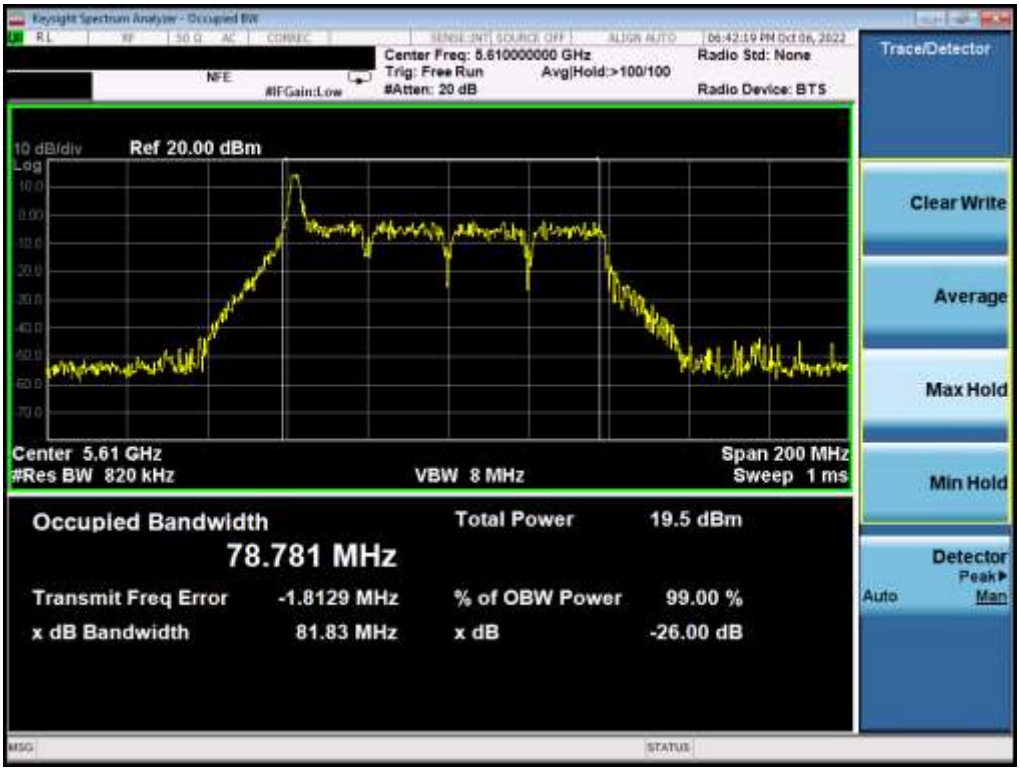
Plot 7-19. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 118)



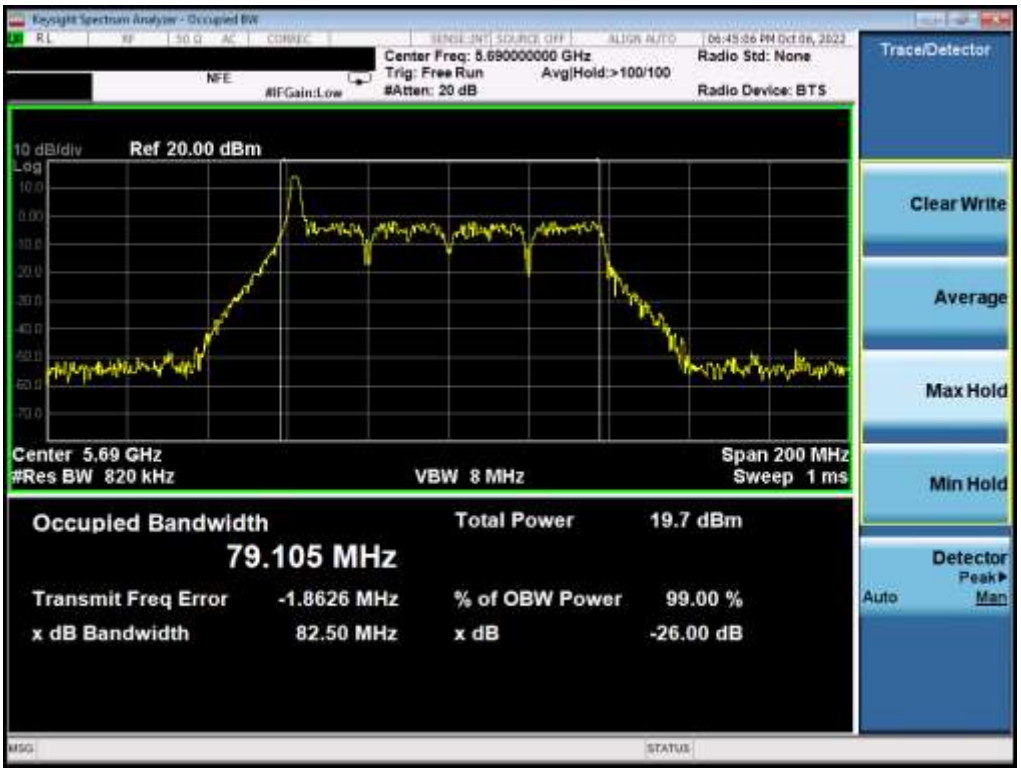
Plot 7-20. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 142)



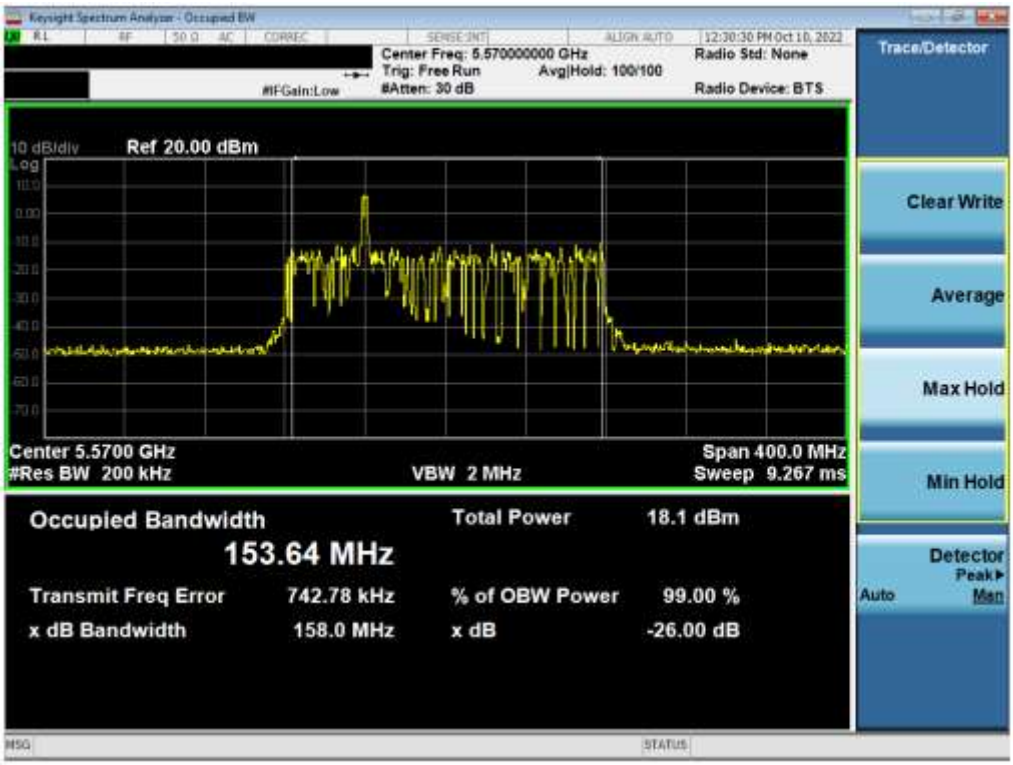
Plot 7-21. 26dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 106)



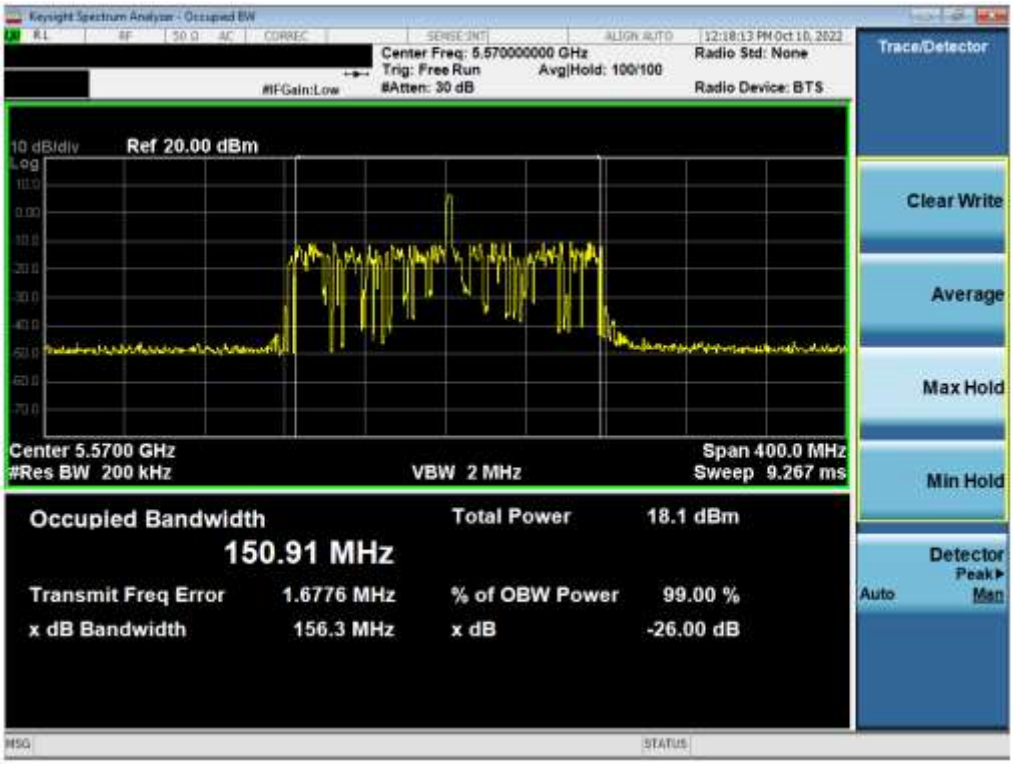
Plot 7-22. 26dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 122)



Plot 7-23. 26dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 138)



Plot 7-24. 26dB Bandwidth Plot MIMO ANT1 (160MHz(L) BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 114)



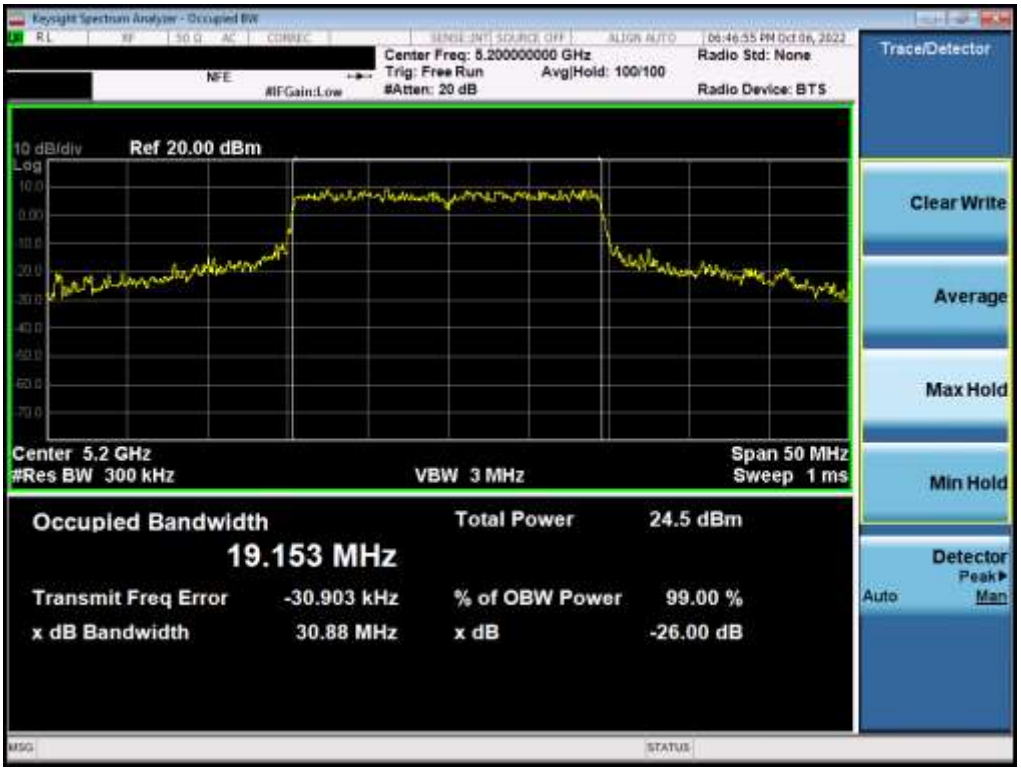
Plot 7-25. 26dB Bandwidth Plot MIMO ANT1 (160MHz(U) BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 114)

MIMO Antenna-1 26 dB Bandwidth Measurements (Full Tones)

	Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	Measured 26dB Bandwidth [MHz]
Band 1	5180	36	ax (20MHz)	242T	MCS0	31.90
	5200	40	ax (20MHz)	242T	MCS0	30.88
	5240	48	ax (20MHz)	242T	MCS0	37.00
	5190	38	ax (40MHz)	484T	MCS0	91.00
	5230	46	ax (40MHz)	484T	MCS0	87.55
	5210	42	ax (80MHz)	996T	MCS0	170.70
Band 1/2A	5250	50	ax (160MHz)	996T*2	MCS0	161.50
Band 2A	5260	52	ax (20MHz)	242T	MCS0	36.52
	5280	56	ax (20MHz)	242T	MCS0	35.01
	5320	64	ax (20MHz)	242T	MCS0	38.41
	5270	54	ax (40MHz)	484T	MCS0	89.33
	5310	62	ax (40MHz)	484T	MCS0	91.35
	5290	58	ax (80MHz)	996T	MCS0	152.30
Band 2C	5500	100	ax (20MHz)	242T	MCS0	38.66
	5600	120	ax (20MHz)	242T	MCS0	39.21
	5720	144	ax (20MHz)	242T	MCS0	40.04
	5510	102	ax (40MHz)	484T	MCS0	91.55
	5590	118	ax (40MHz)	484T	MCS0	78.13
	5710	142	ax (40MHz)	484T	MCS0	87.87
	5530	106	ax (80MHz)	996T	MCS0	153.10
	5610	122	ax (80MHz)	996T	MCS0	134.10
	5690	138	ax (80MHz)	996T	MCS0	150.40
	5570	114	ax (160MHz)	996T*2	MCS0	162.00

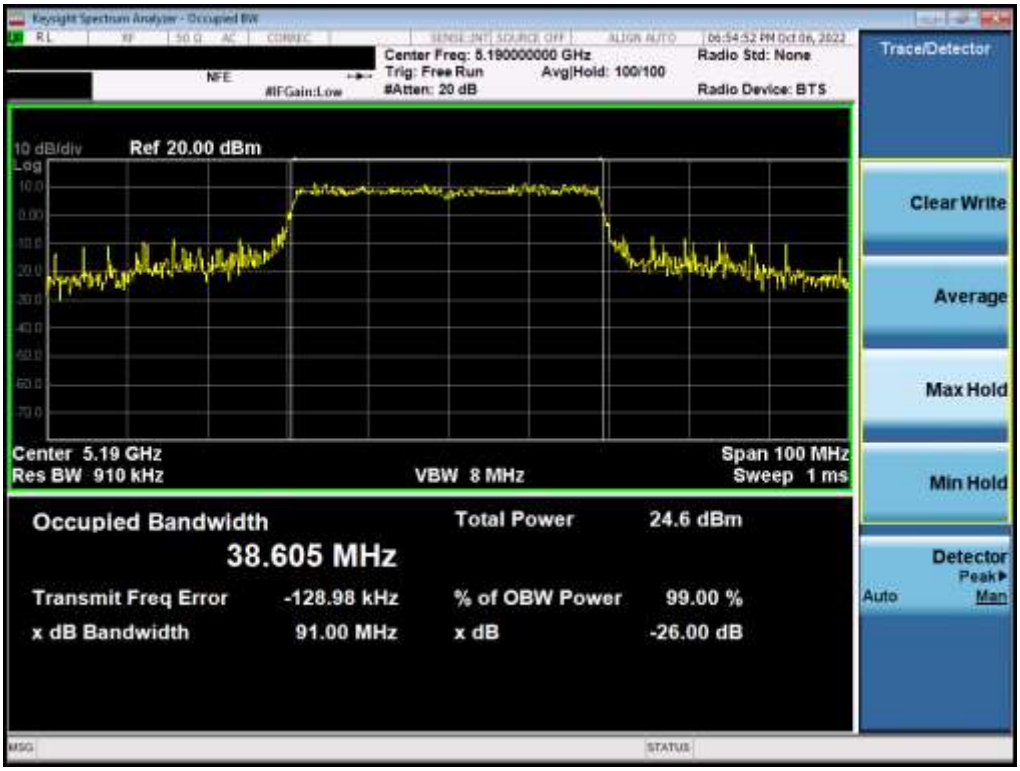
Table 7-3. Conducted Bandwidth Measurements MIMO ANT1 (Full Tones)

Plot 7-26. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 242 Tones (UNII Band 1) – Ch. 36)



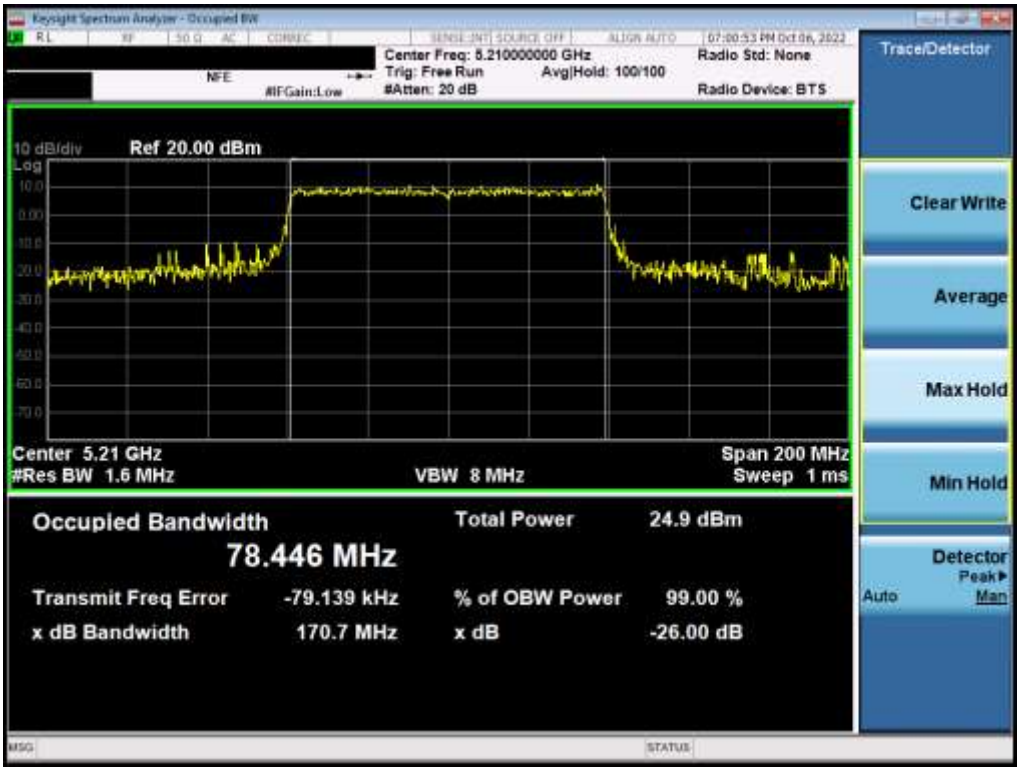
Plot 7-27. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 242 Tones (UNII Band 1) – Ch. 40)

Plot 7-28. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 242 Tones (UNII Band 1) – Ch. 48)

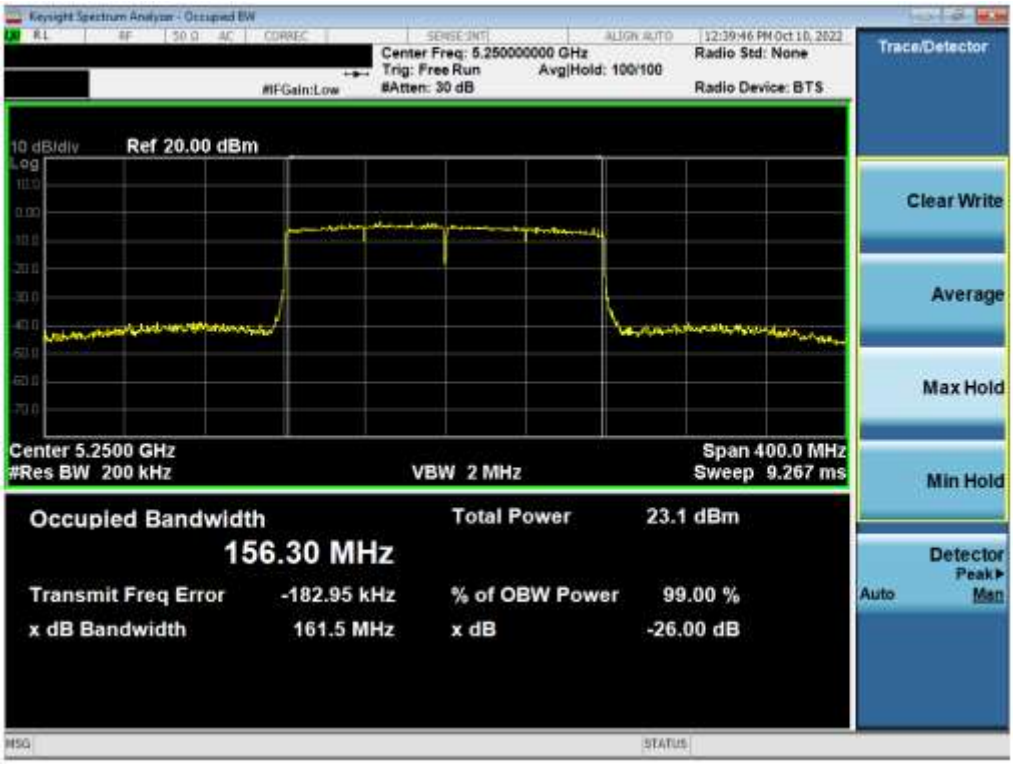


Plot 7-29. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax – 484 Tones (UNII Band 1) – Ch. 38)

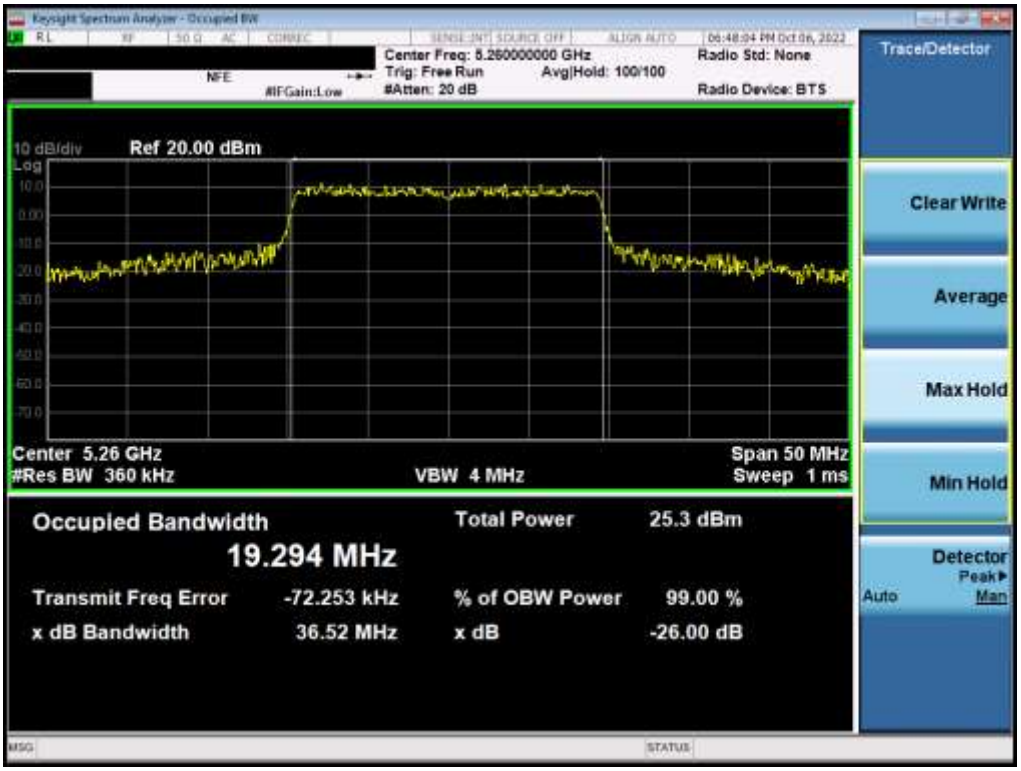
Plot 7-30. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax – 484 Tones (UNII Band 1) – Ch. 46)



Plot 7-31. 26dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax – 996 Tones (UNII Band 1) – Ch. 42)

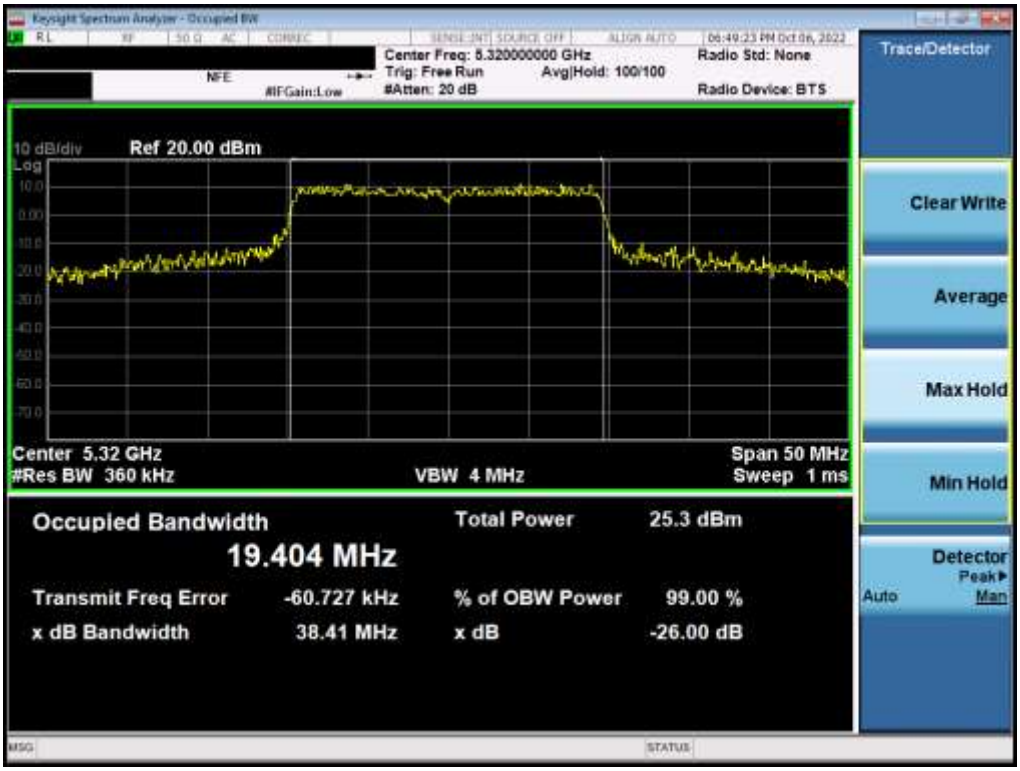


Plot 7-32. 26dB Bandwidth Plot MIMO ANT1 (160MHz BW 802.11ax – 996*2 Tones (UNII Band 1/2A) – Ch. 50)



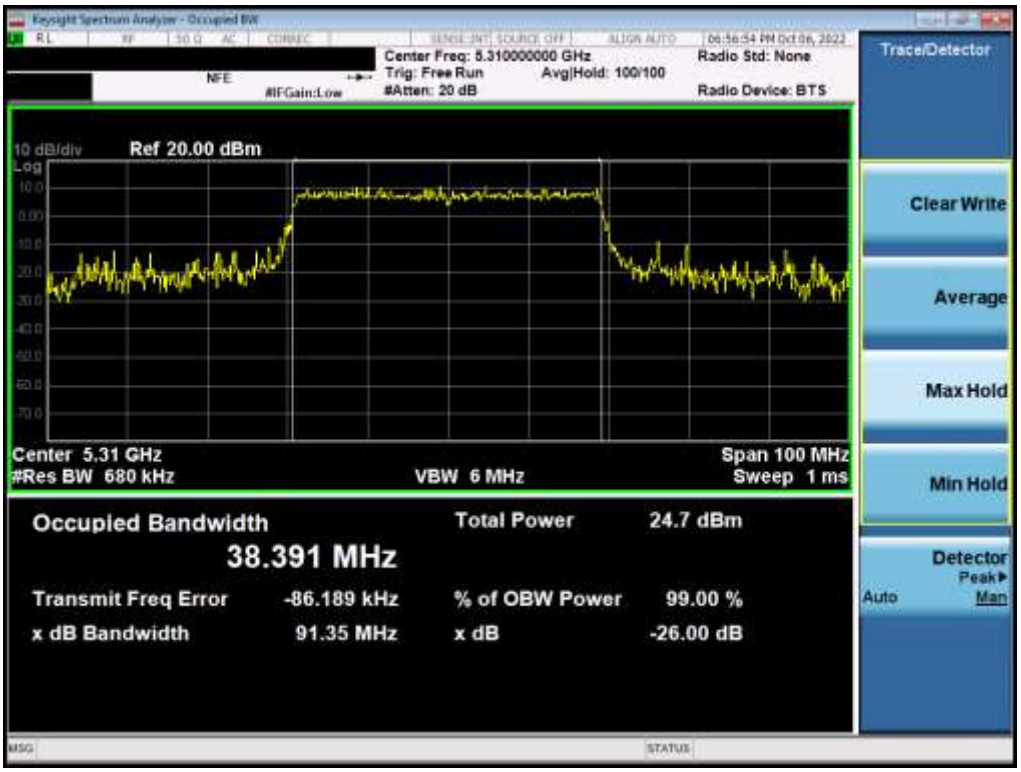
Plot 7-33. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 242 Tones (UNII Band 2A) – Ch. 52)

Plot 7-34. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 242 Tones (UNII Band 2A) – Ch. 56)



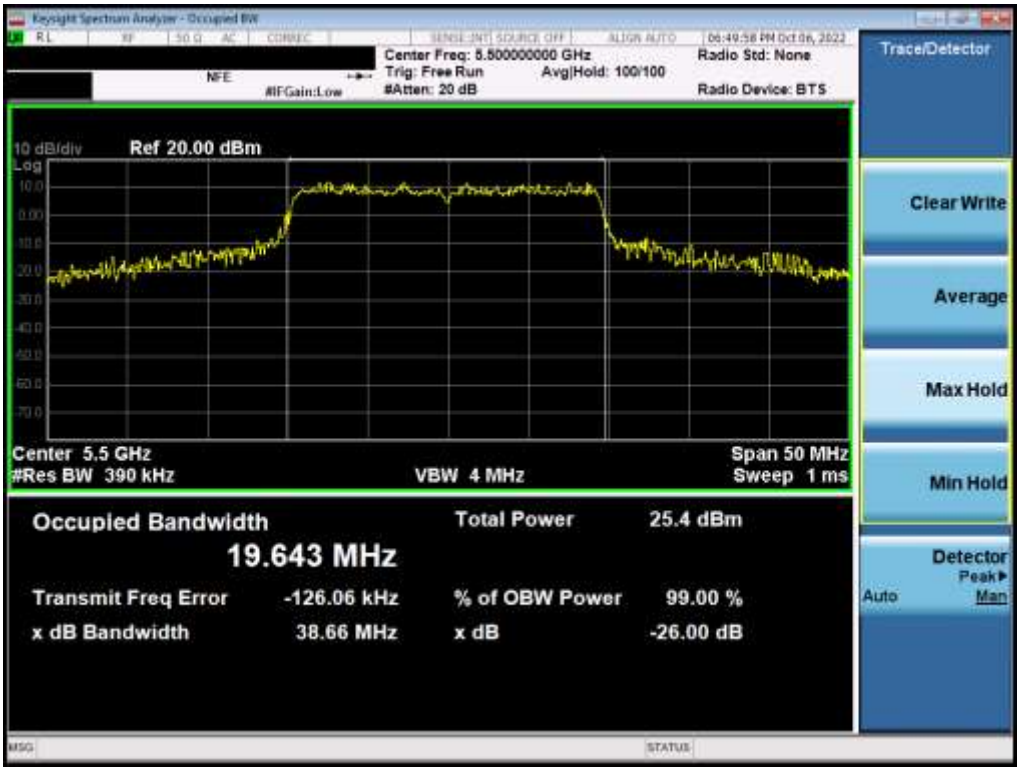
Plot 7-35. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 242 Tones (UNII Band 2A) – Ch. 64)

Plot 7-36. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax – 484 Tones (UNII Band 2A) – Ch. 54)



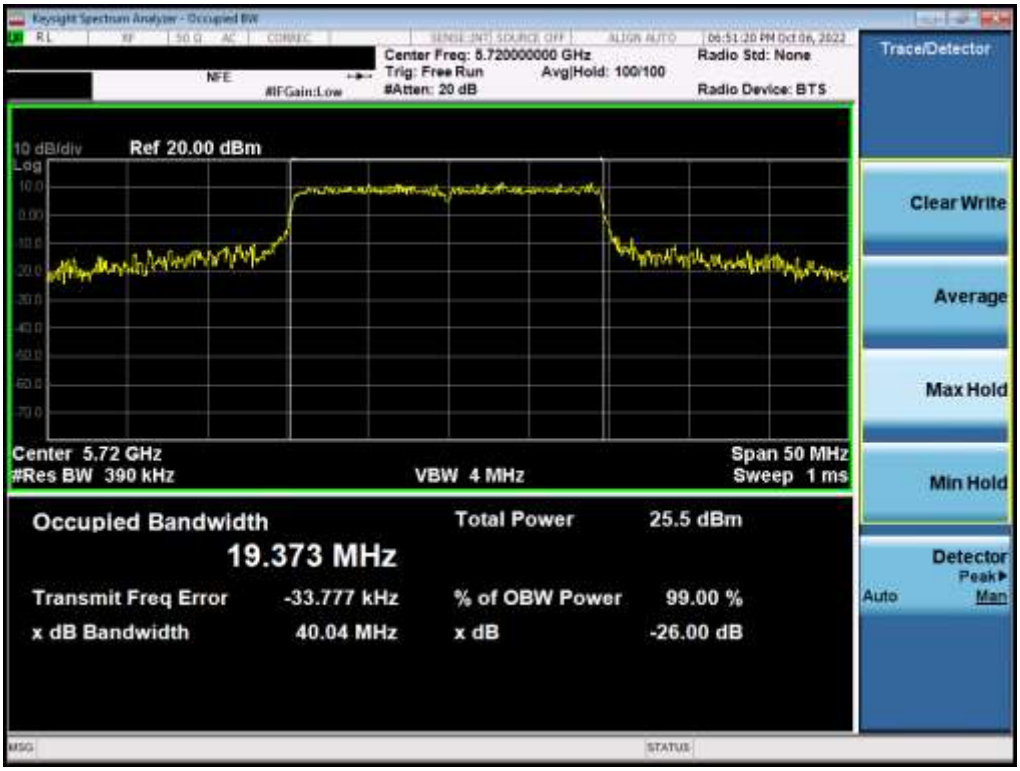
Plot 7-37. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax – 484 Tones (UNII Band 2A) – Ch. 62)

Plot 7-38. 26dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax – 996 Tones (UNII Band 2A) – Ch. 58)



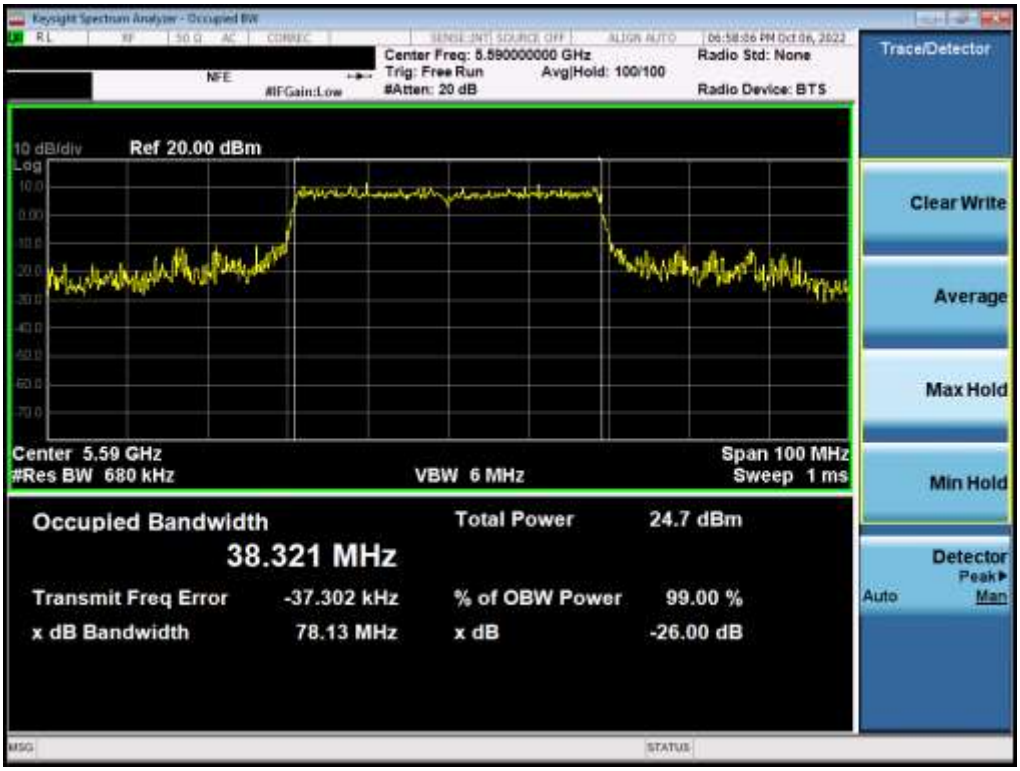
Plot 7-39. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 242 Tones (UNII Band 2C) – Ch. 100)

Plot 7-40. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 242 Tones (UNII Band 2C) – Ch. 120)



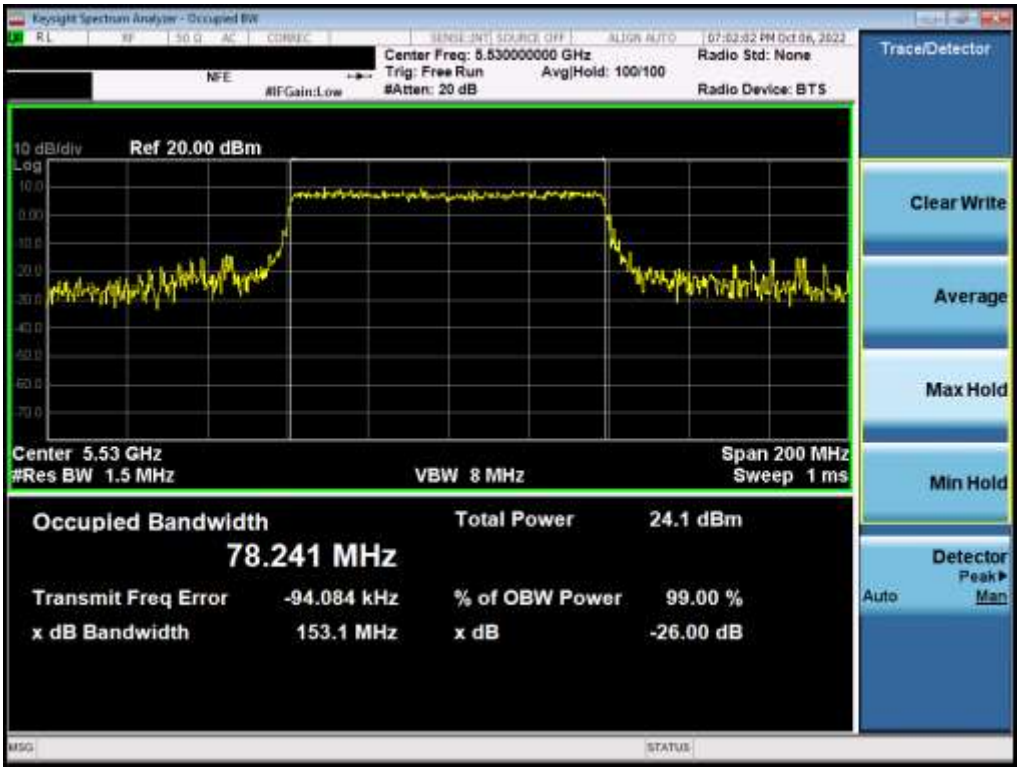
Plot 7-41. 26dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 242 Tones (UNII Band 2C) – Ch. 144)

Plot 7-42. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax – 484 Tones (UNII Band 2C) – Ch. 102)



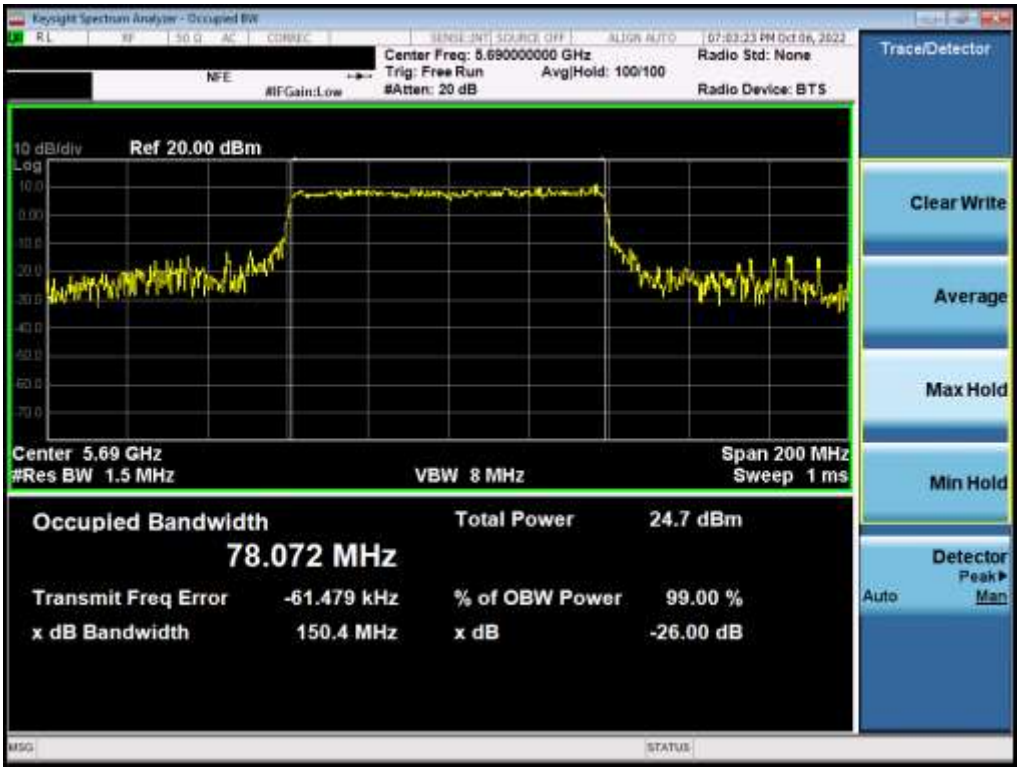
Plot 7-43. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax – 484 Tones (UNII Band 2C) – Ch. 118)

Plot 7-44. 26dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax – 484 Tones (UNII Band 2C) – Ch. 142)

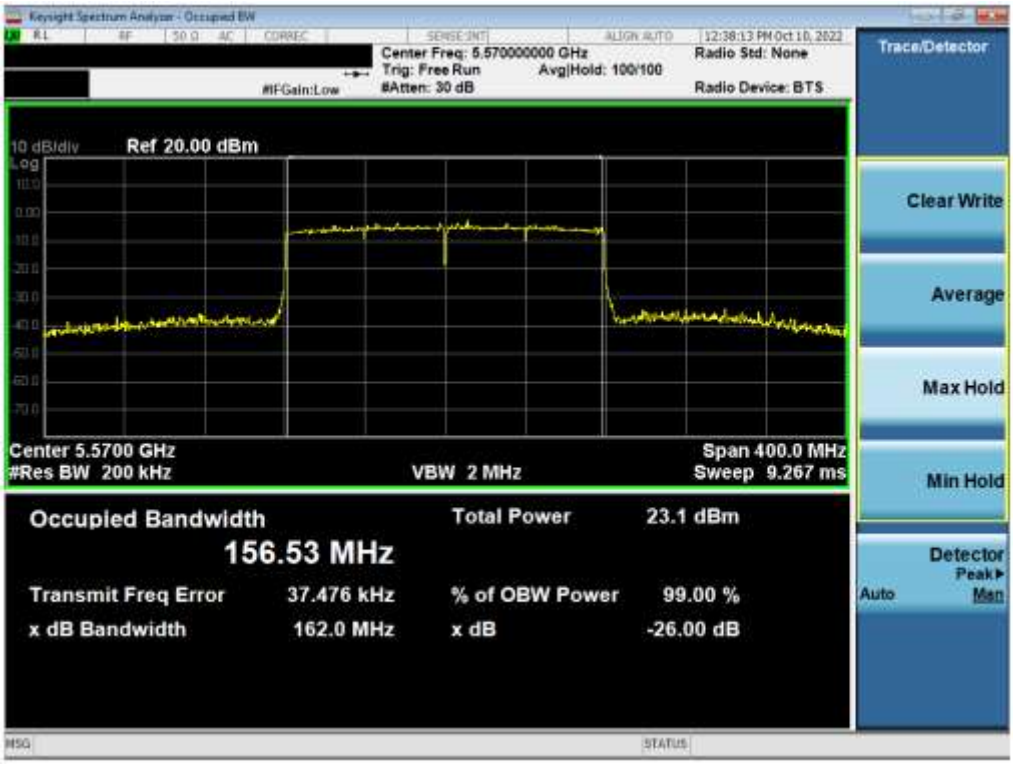


Plot 7-45. 26dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax – 996 Tones (UNII Band 2C) – Ch. 106)

Plot 7-46. 26dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax – 996 Tones (UNII Band 2C) – Ch. 122)



Plot 7-47. 26dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax – 996 Tones (UNII Band 2C) – Ch. 138)

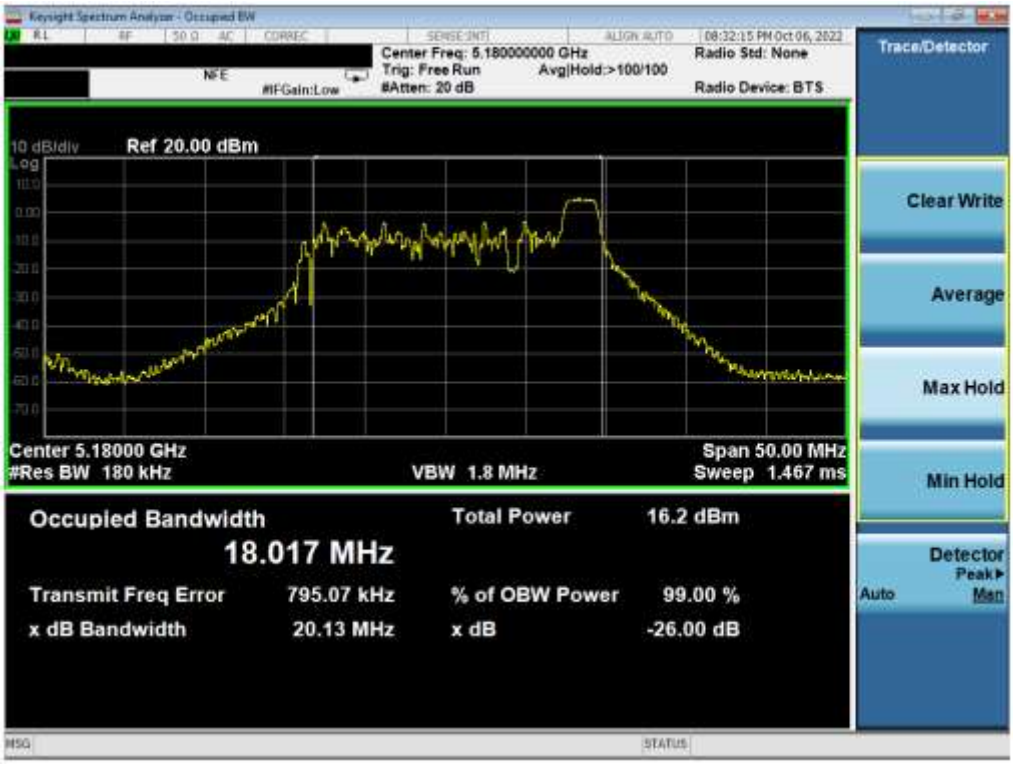


Plot 7-48. 26dB Bandwidth Plot MIMO ANT1 (160MHz BW 802.11ax – 996*2 Tones (UNII Band 2C) – Ch. 114)

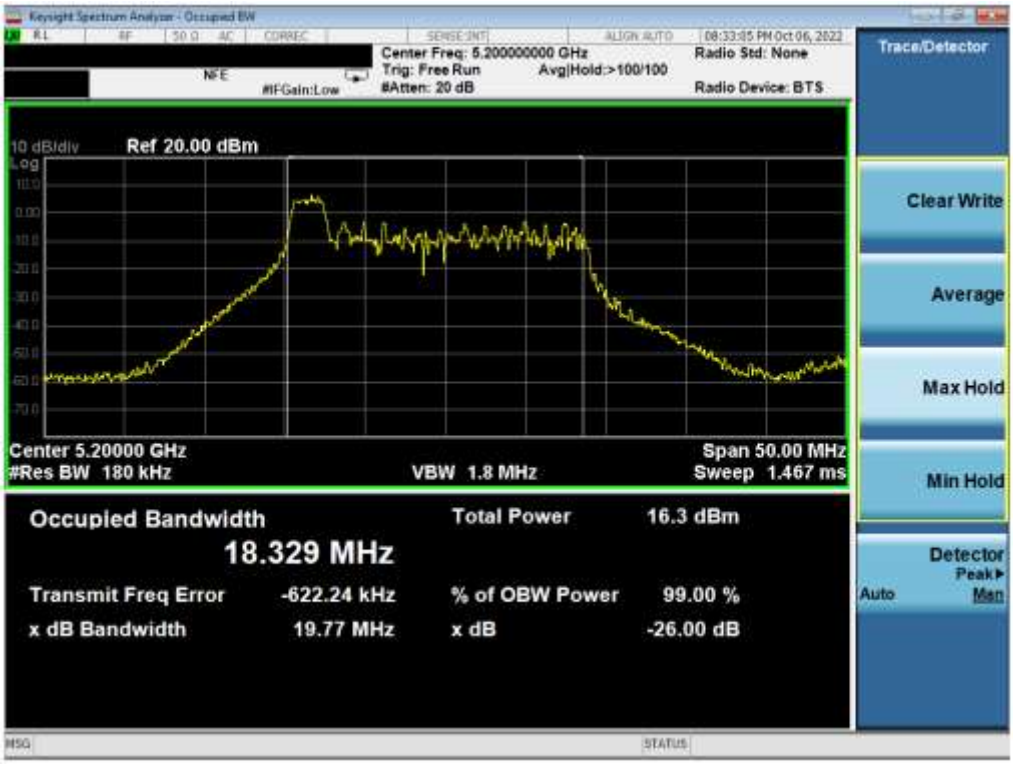
MIMO Antenna-2 26dB Bandwidth Measurements (26 Tones)

	Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	Measured 26dB Bandwidth [MHz]
Band 1	5180	36	ax (20MHz)	26T	MCS0	20.13
	5200	40	ax (20MHz)	26T	MCS0	19.77
	5240	48	ax (20MHz)	26T	MCS0	18.31
	5190	38	ax (40MHz)	26T	MCS0	40.04
	5230	46	ax (40MHz)	26T	MCS0	38.07
	5210	42	ax (80MHz)	26T	MCS0	81.10
Band 1/2A	5250	50	ax (160MHz L)	26T	MCS0	158.50
	5250	50	ax (160MHz U)	26T	MCS0	155.60
Band 2A	5260	52	ax (20MHz)	26T	MCS0	20.32
	5280	56	ax (20MHz)	26T	MCS0	20.03
	5320	64	ax (20MHz)	26T	MCS0	19.70
	5270	54	ax (40MHz)	26T	MCS0	37.95
	5310	62	ax (40MHz)	26T	MCS0	39.71
	5290	58	ax (80MHz)	26T	MCS0	80.72
Band 2C	5500	100	ax (20MHz)	26T	MCS0	18.39
	5600	120	ax (20MHz)	26T	MCS0	20.13
	5720	144	ax (20MHz)	26T	MCS0	19.73
	5510	102	ax (40MHz)	26T	MCS0	38.04
	5590	118	ax (40MHz)	26T	MCS0	39.86
	5710	142	ax (40MHz)	26T	MCS0	40.35
	5530	106	ax (80MHz)	26T	MCS0	80.69
	5610	122	ax (80MHz)	26T	MCS0	81.65
	5690	138	ax (80MHz)	26T	MCS0	81.10
	5570	114	ax (160MHz L)	26T	MCS0	157.90
	5570	114	ax (160MHz U)	26T	MCS0	158.00

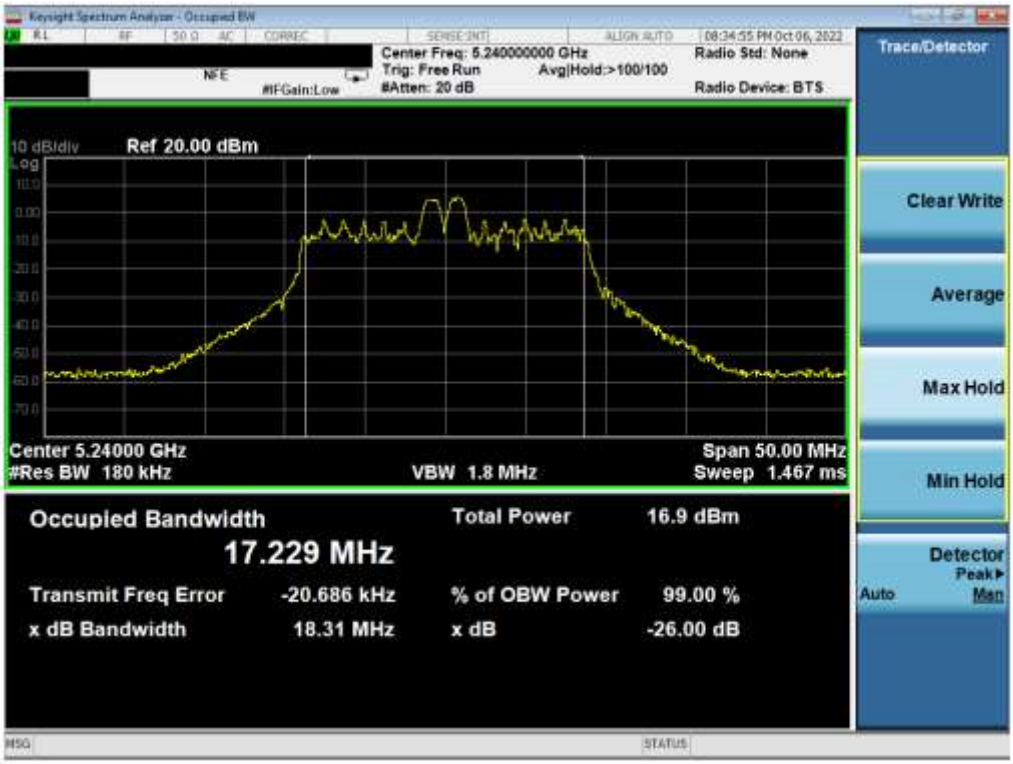
Table 7-4. Conducted Bandwidth Measurements MIMO ANT2 (26 Tones)



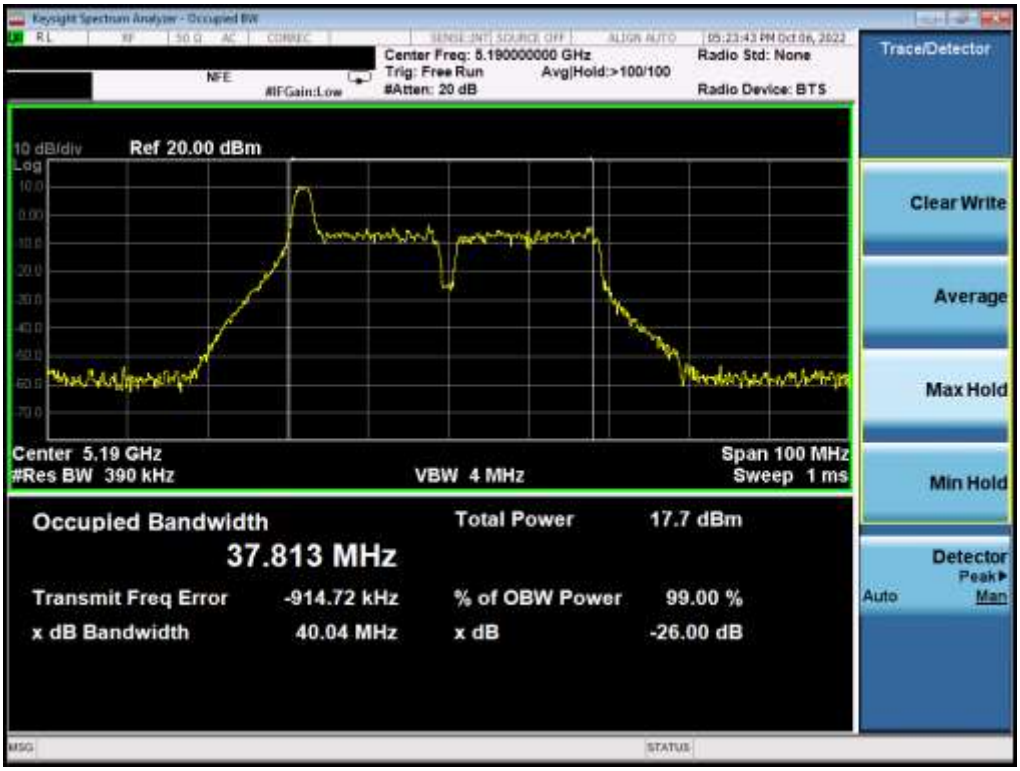
Plot 7-49. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 36)



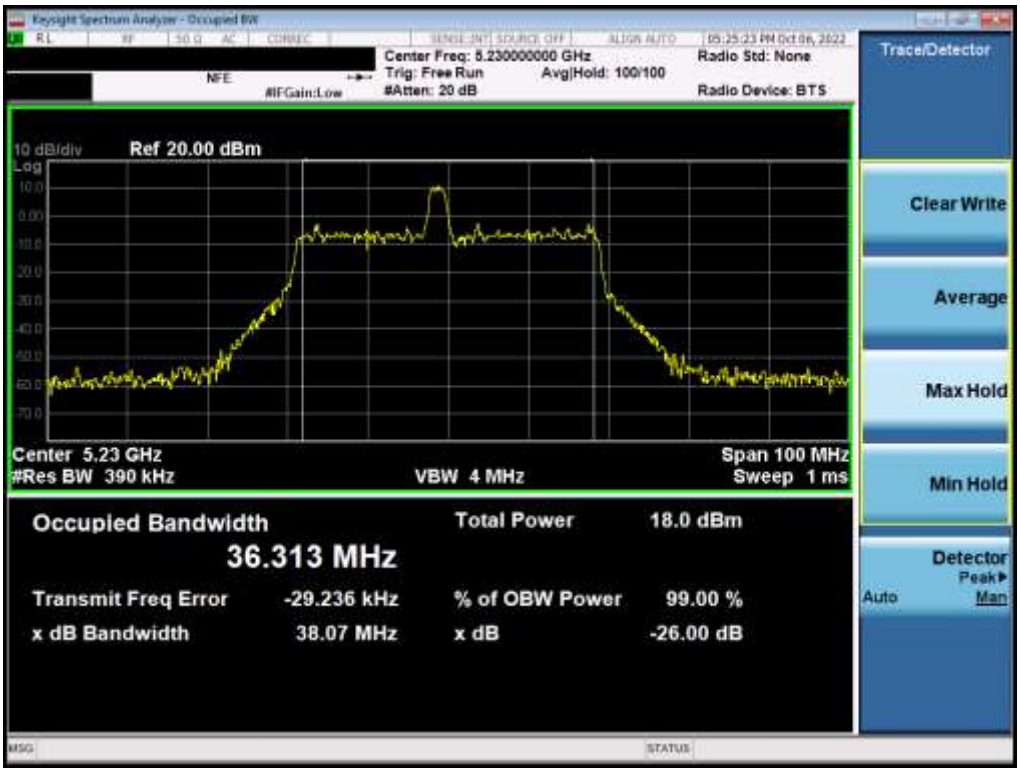
Plot 7-50. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 40)



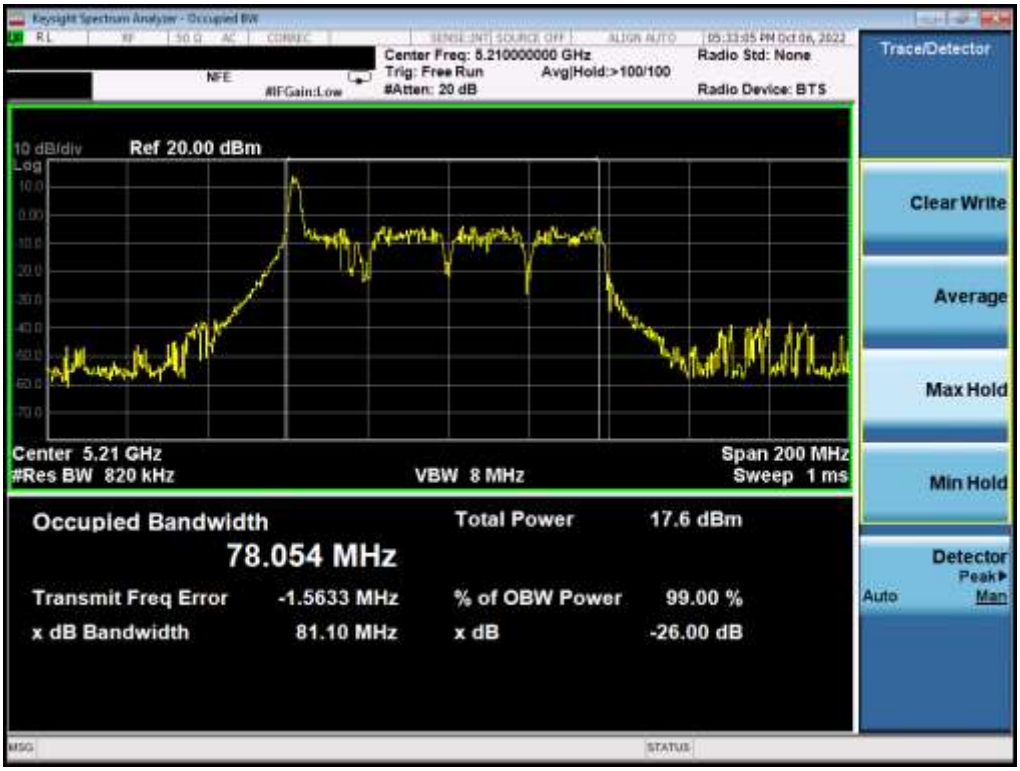
Plot 7-51. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 48)



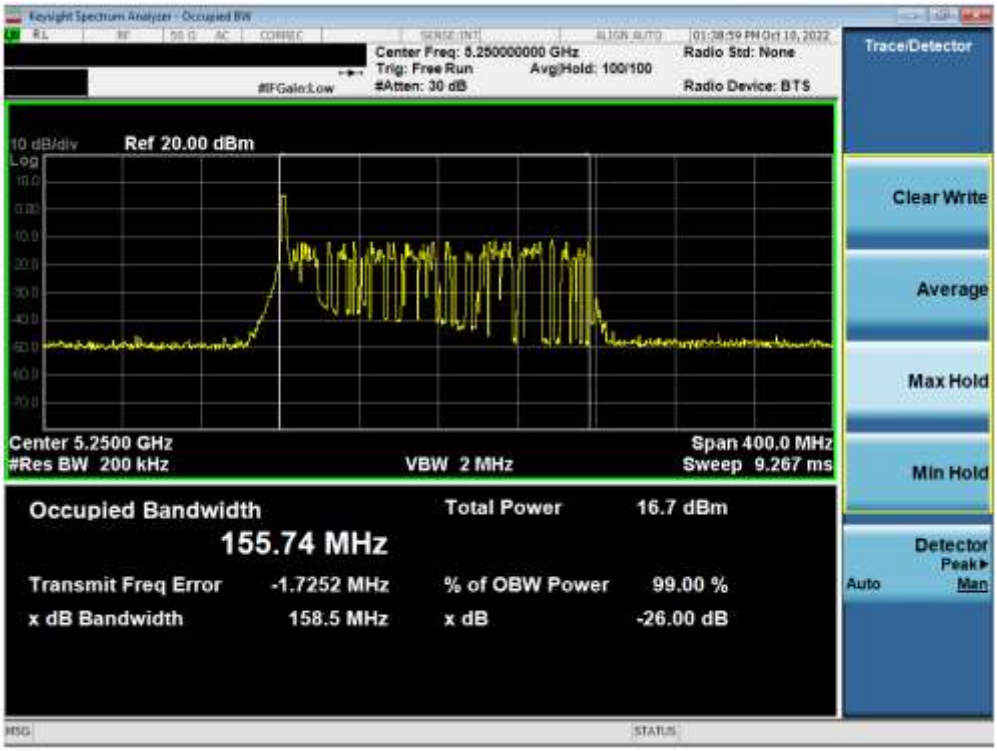
Plot 7-52. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 38)



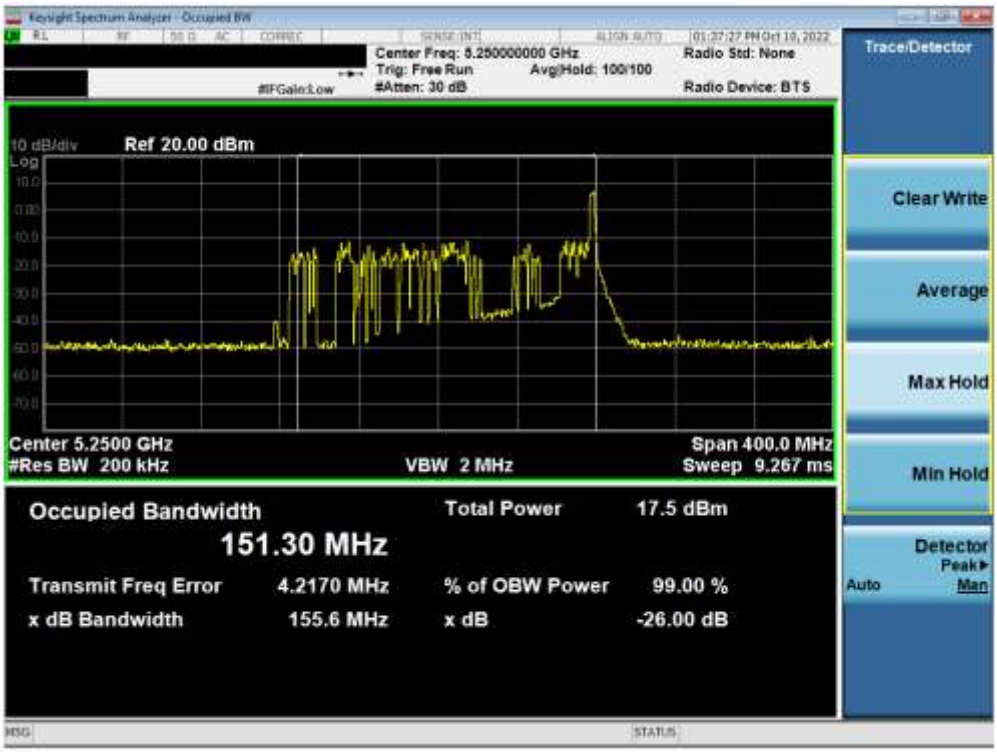
Plot 7-53. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 46)



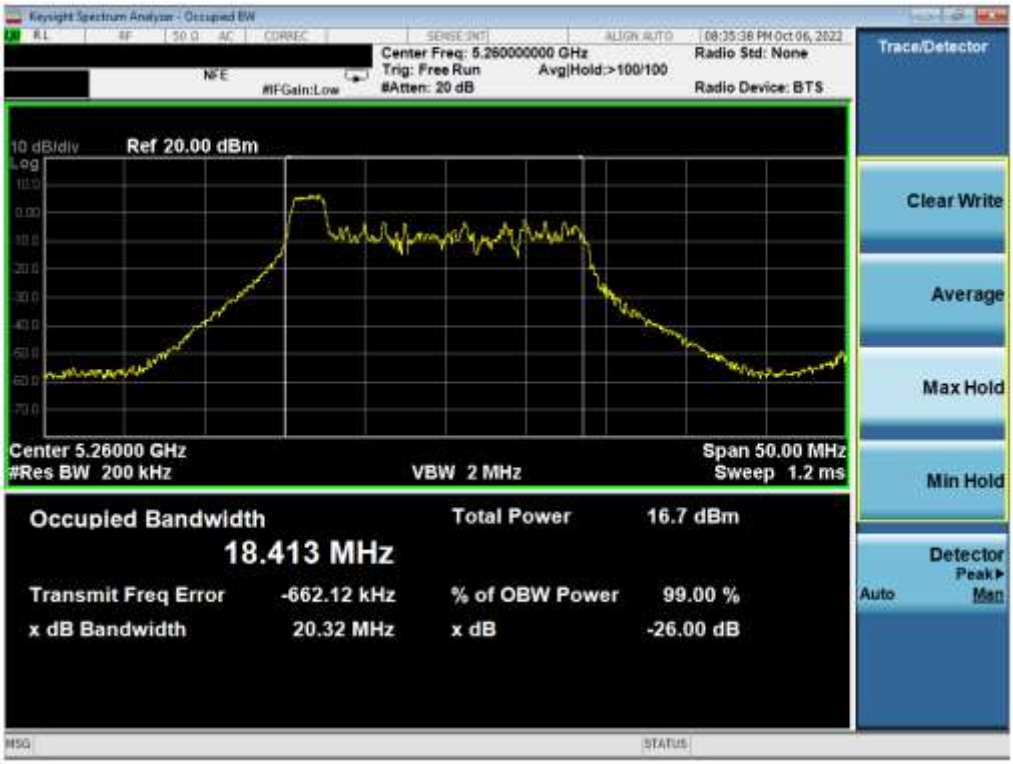
Plot 7-54. 26dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11ax – 26 Tones (UNII Band 1) – Ch. 42)



Plot 7-55. 26dB Bandwidth Plot MIMO ANT2 (160MHz(L) BW 802.11ax – 26 Tones (UNII Band 1/2A) – Ch. 50)

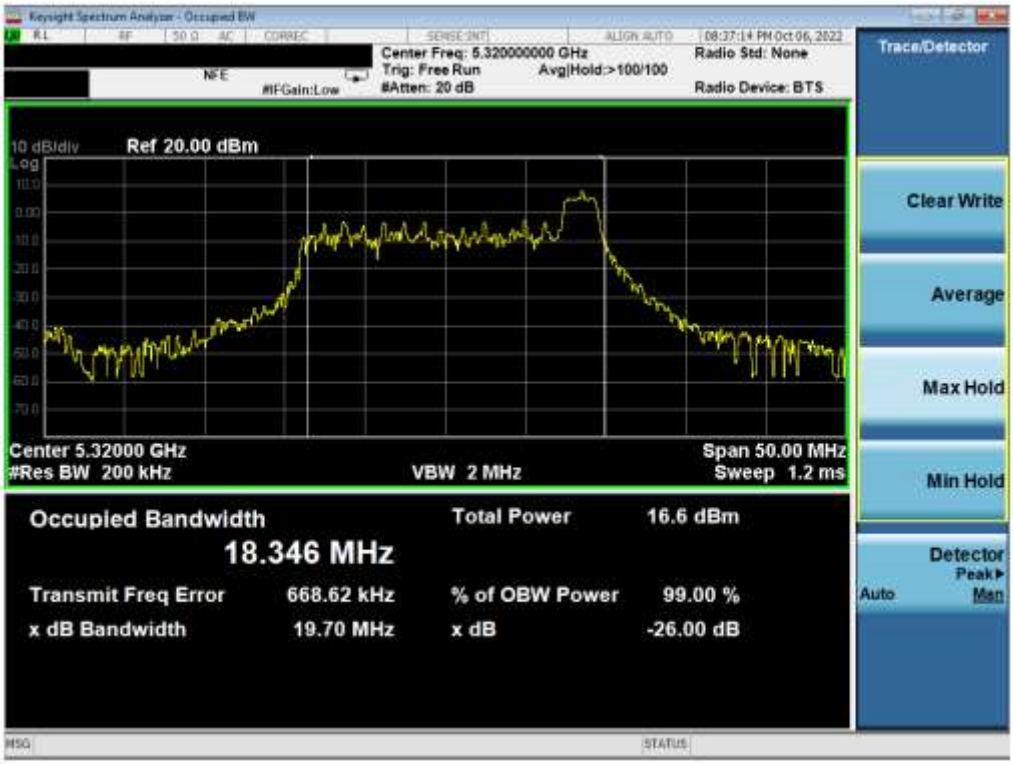


Plot 7-56. 26dB Bandwidth Plot MIMO ANT2 (160MHz(U) BW 802.11ax – 26 Tones (UNII Band 1/2A) – Ch. 50)

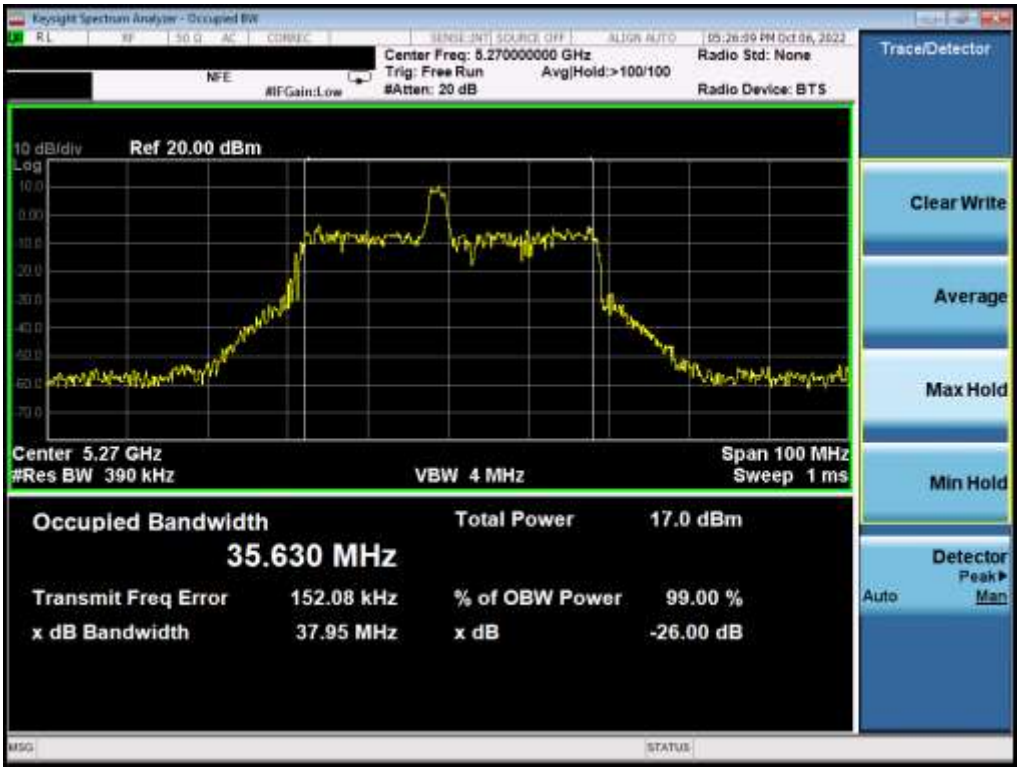


Plot 7-57. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 52)

Plot 7-58. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 56)

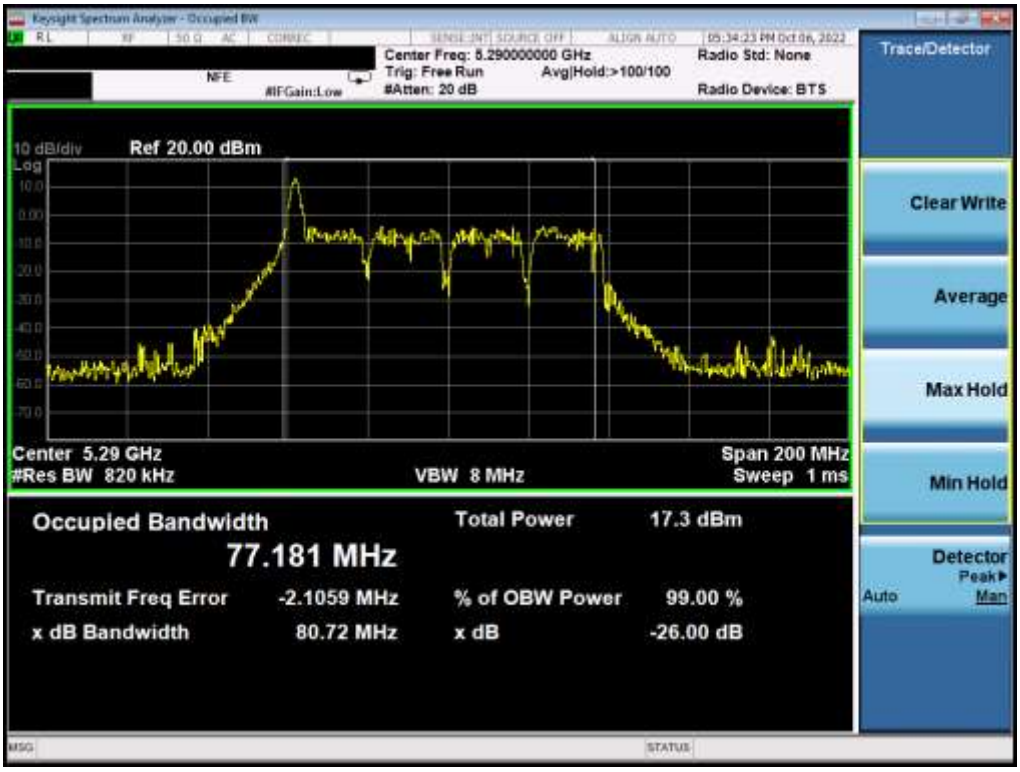


Plot 7-59. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 64)

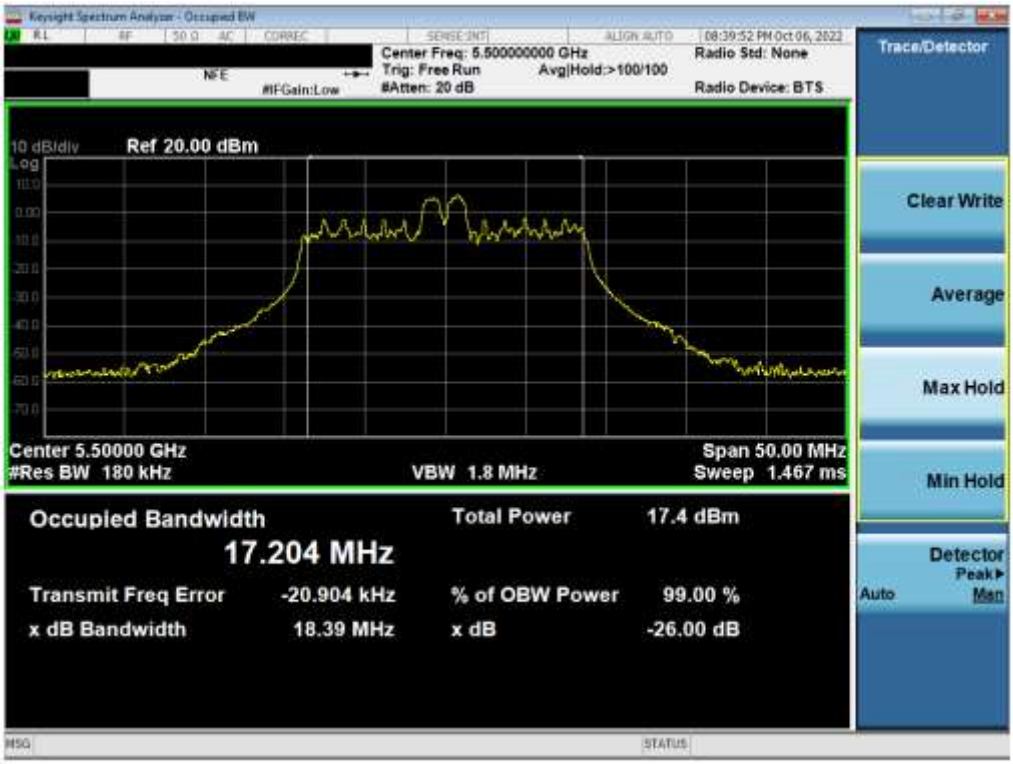


Plot 7-60. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 54)

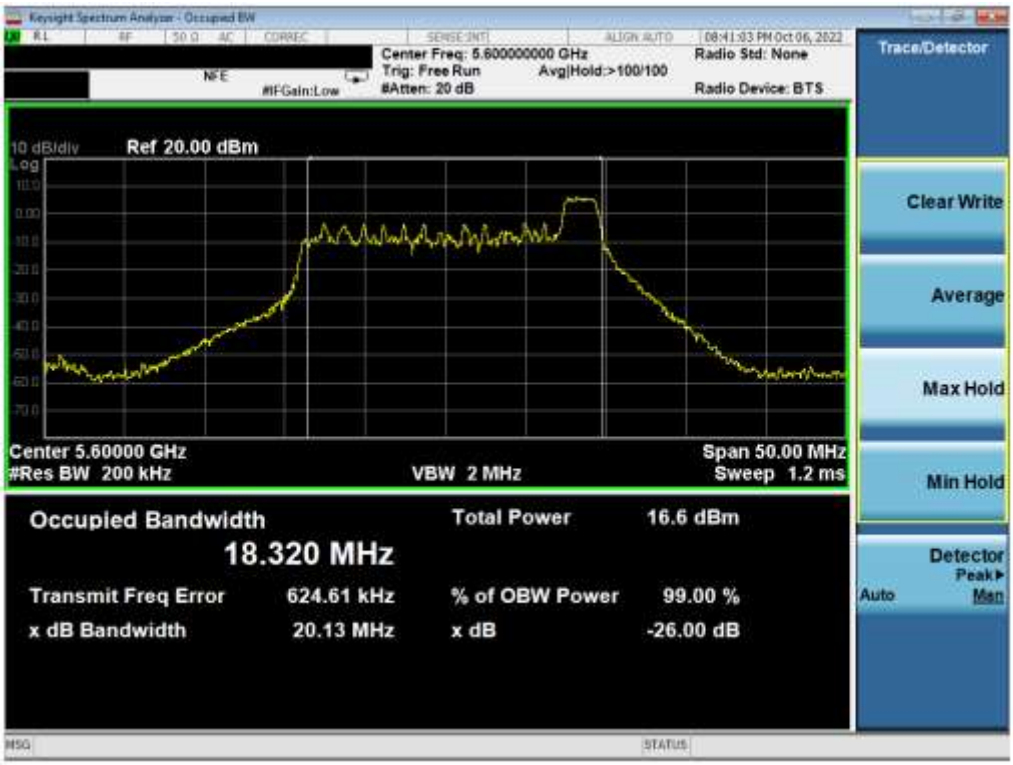
Plot 7-61. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 62)



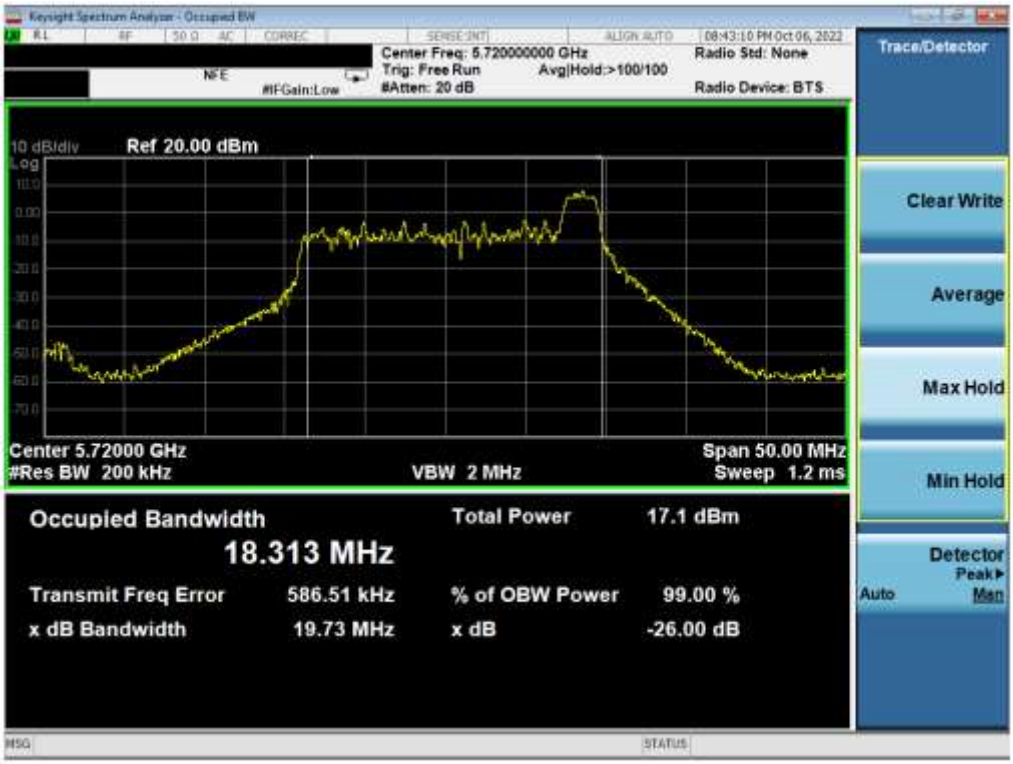
Plot 7-62. 26dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11ax – 26 Tones (UNII Band 2A) – Ch. 58)



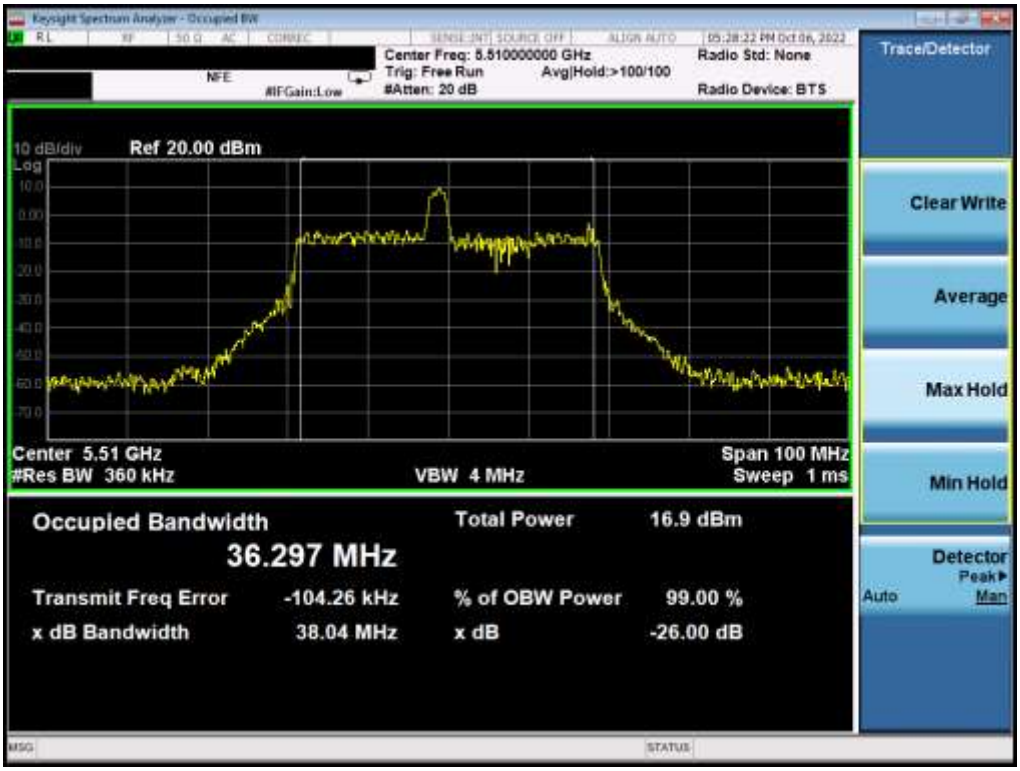
Plot 7-63. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 100)



Plot 7-64. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 120)

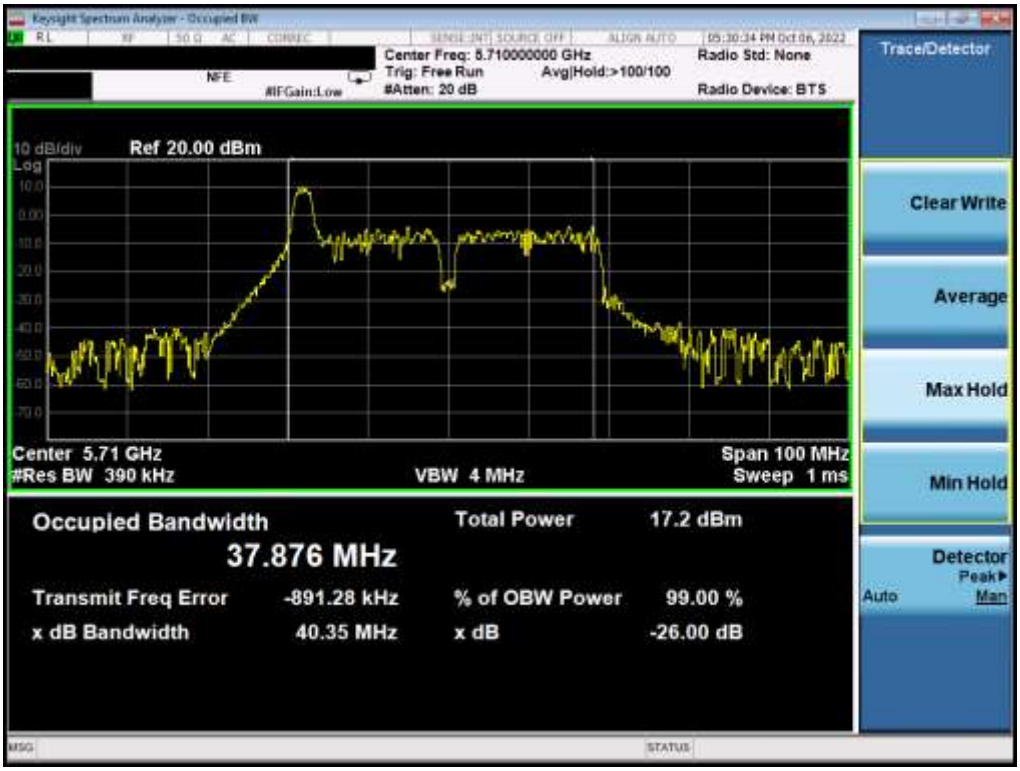


Plot 7-65. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 144)



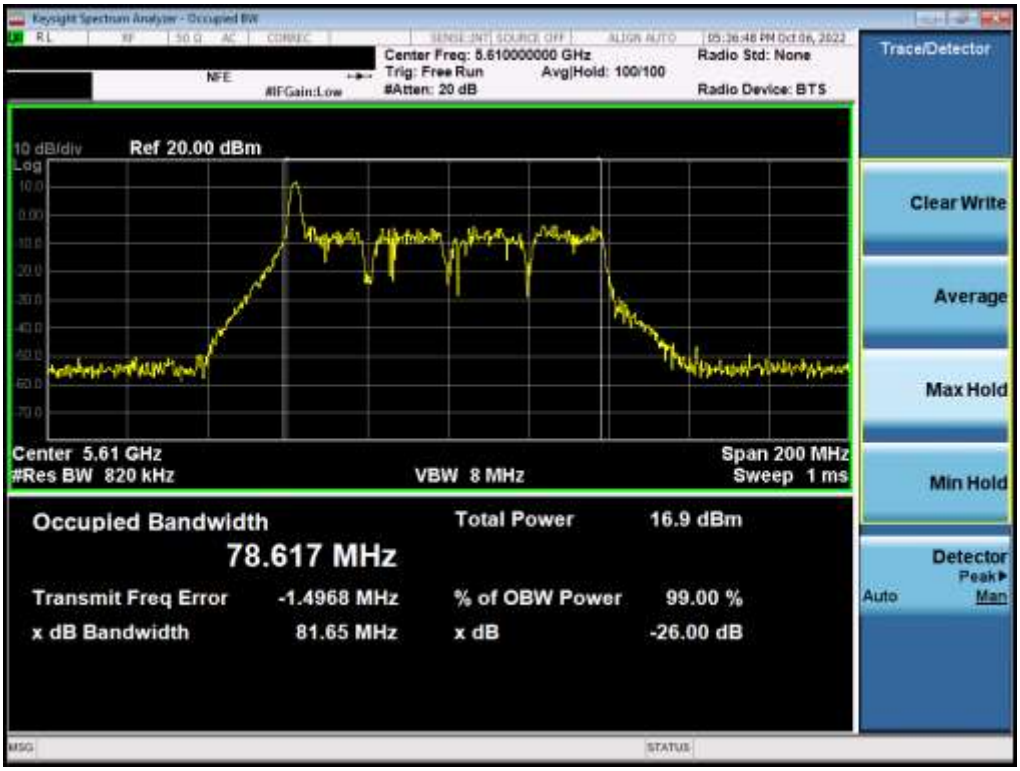
Plot 7-66. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 102)

Plot 7-67. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 118)

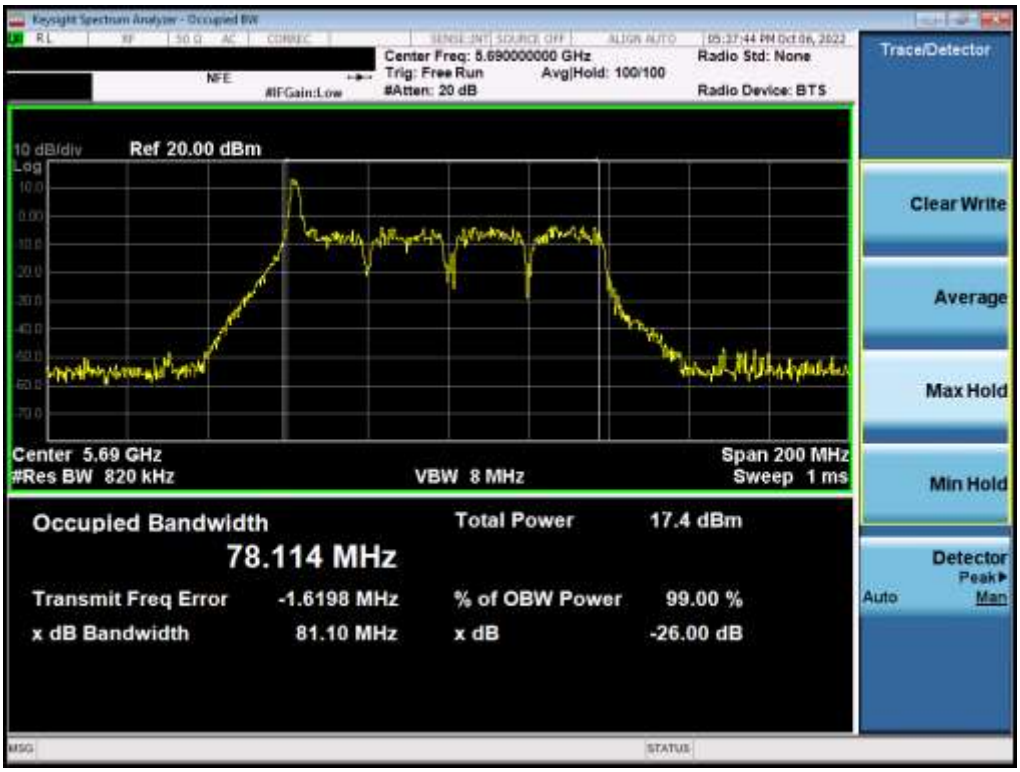


Plot 7-68. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 142)

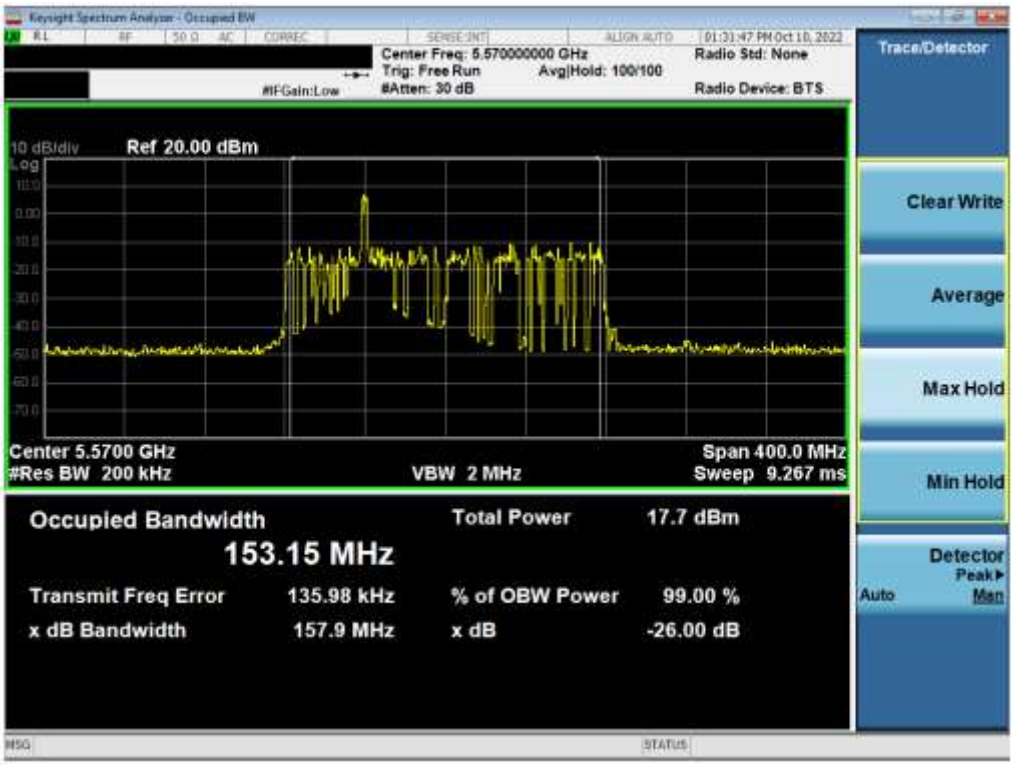
Plot 7-69. 26dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 106)



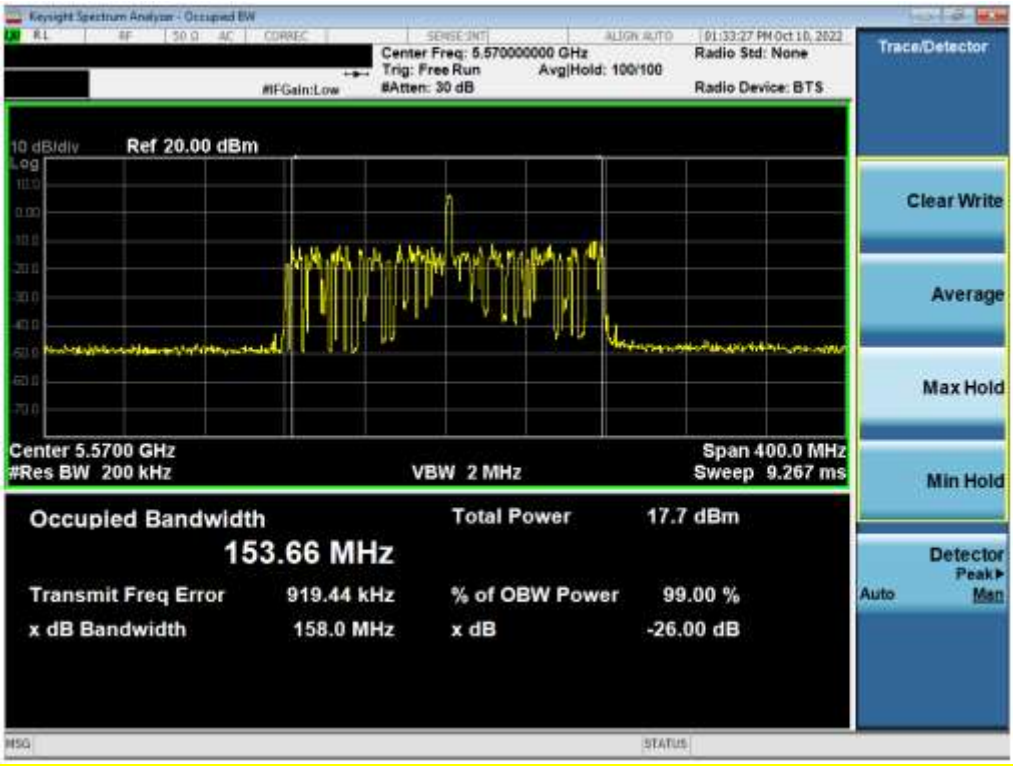
Plot 7-70. 26dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 122)



Plot 7-71. 26dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 138)



Plot 7-72. 26dB Bandwidth Plot MIMO ANT2 (160MHz(L) BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 114)

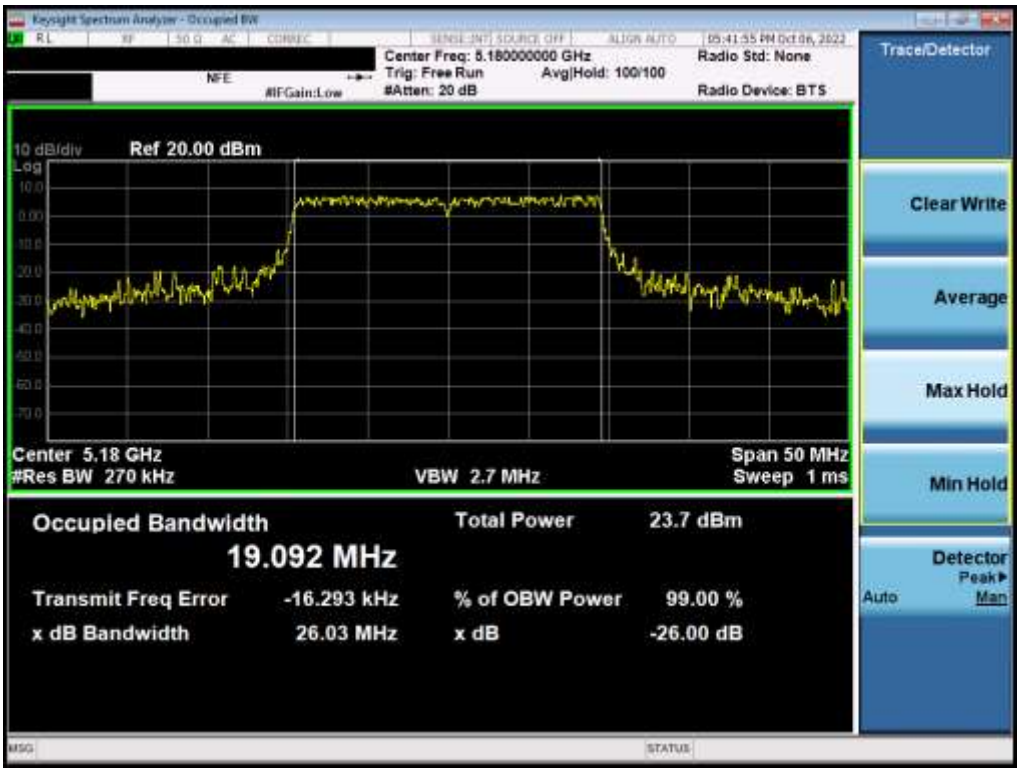


Plot 7-73. 26dB Bandwidth Plot MIMO ANT2 (160MHz(U) BW 802.11ax – 26 Tones (UNII Band 2C) – Ch. 114)

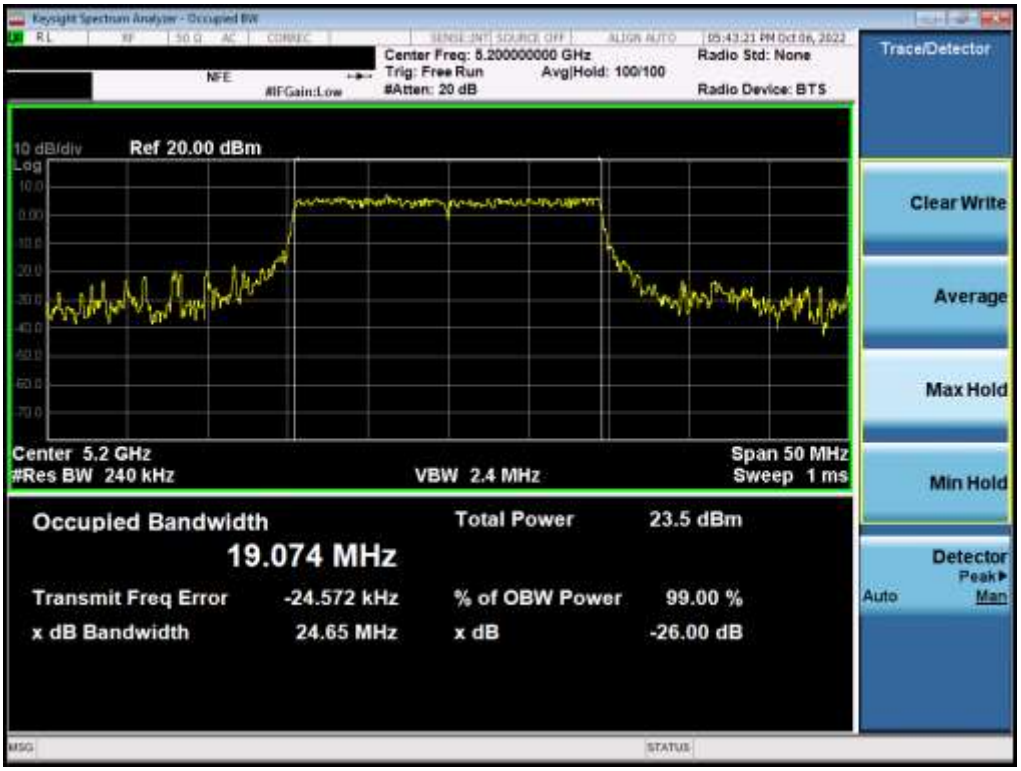
MIMO Antenna-2 26dB Bandwidth Measurements (Full Tones)

	Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	Measured 26dB Bandwidth [MHz]
Band 1	5180	36	ax (20MHz)	242T	MCS0	26.03
	5200	40	ax (20MHz)	242T	MCS0	24.65
	5240	48	ax (20MHz)	242T	MCS0	21.75
	5190	38	ax (40MHz)	484T	MCS0	44.51
	5230	46	ax (40MHz)	484T	MCS0	46.07
	5210	42	ax (80MHz)	996T	MCS0	85.45
Band 1/2A	5250	50	ax (160MHz)	996T*2	MCS0	161.50
Band 2A	5260	52	ax (20MHz)	242T	MCS0	25.38
	5280	56	ax (20MHz)	242T	MCS0	23.28
	5320	64	ax (20MHz)	242T	MCS0	22.75
	5270	54	ax (40MHz)	484T	MCS0	44.59
	5310	62	ax (40MHz)	484T	MCS0	42.78
	5290	58	ax (80MHz)	996T	MCS0	85.50
Band 2C	5500	100	ax (20MHz)	242T	MCS0	27.92
	5600	120	ax (20MHz)	242T	MCS0	40.82
	5720	144	ax (20MHz)	242T	MCS0	33.08
	5510	102	ax (40MHz)	484T	MCS0	46.45
	5590	118	ax (40MHz)	484T	MCS0	45.48
	5710	142	ax (40MHz)	484T	MCS0	54.74
	5530	106	ax (80MHz)	996T	MCS0	86.11
	5610	122	ax (80MHz)	996T	MCS0	86.00
	5690	138	ax (80MHz)	996T	MCS0	134.80
	5570	114	ax (160MHz)	996T*2	MCS0	160.60

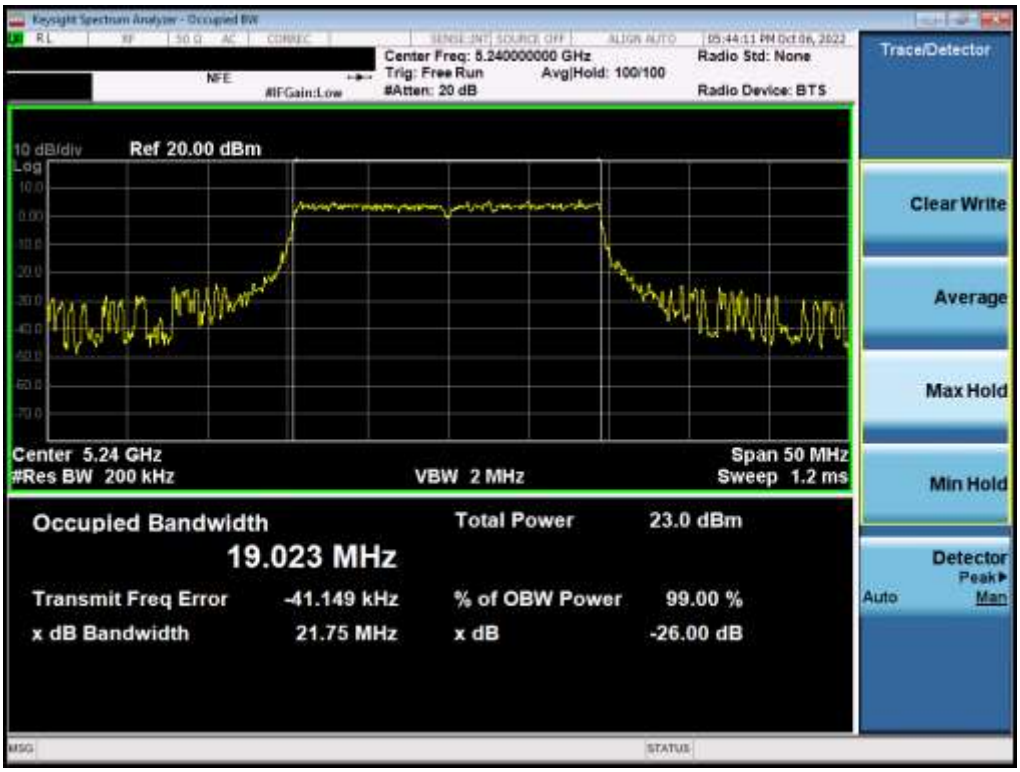
Table 7-5. Conducted Bandwidth Measurements MIMO ANT2 (Full Tones)



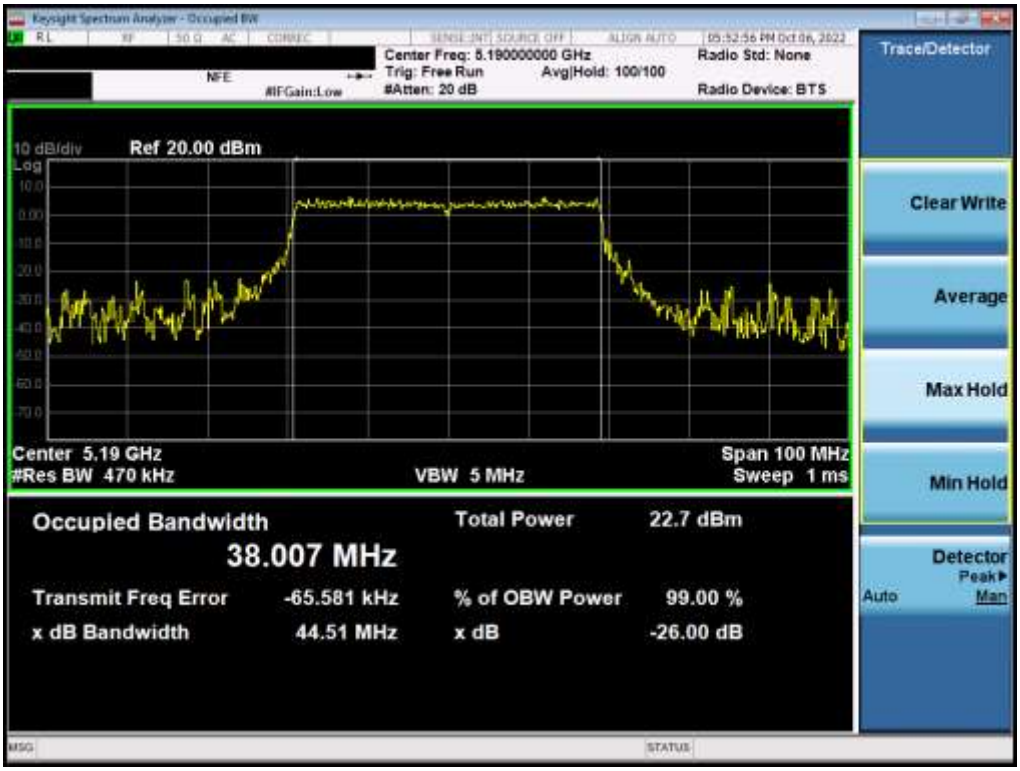
Plot 7-74. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 242 Tones (UNII Band 1) – Ch. 36)



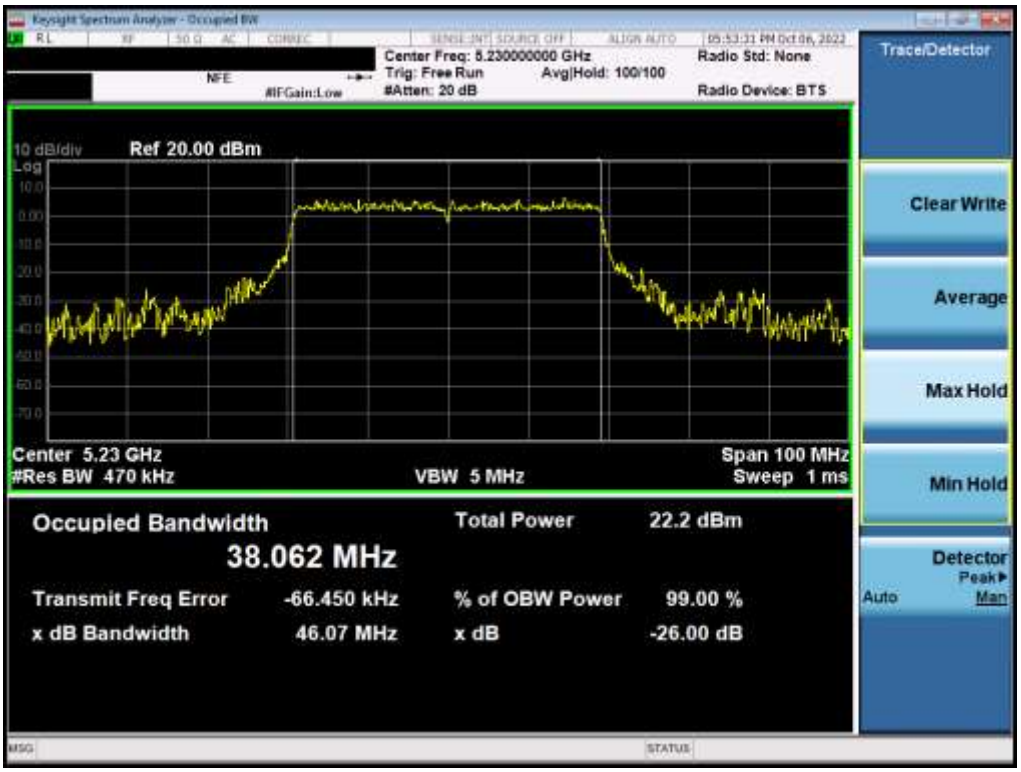
Plot 7-75. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 242 Tones (UNII Band 1) – Ch. 40)



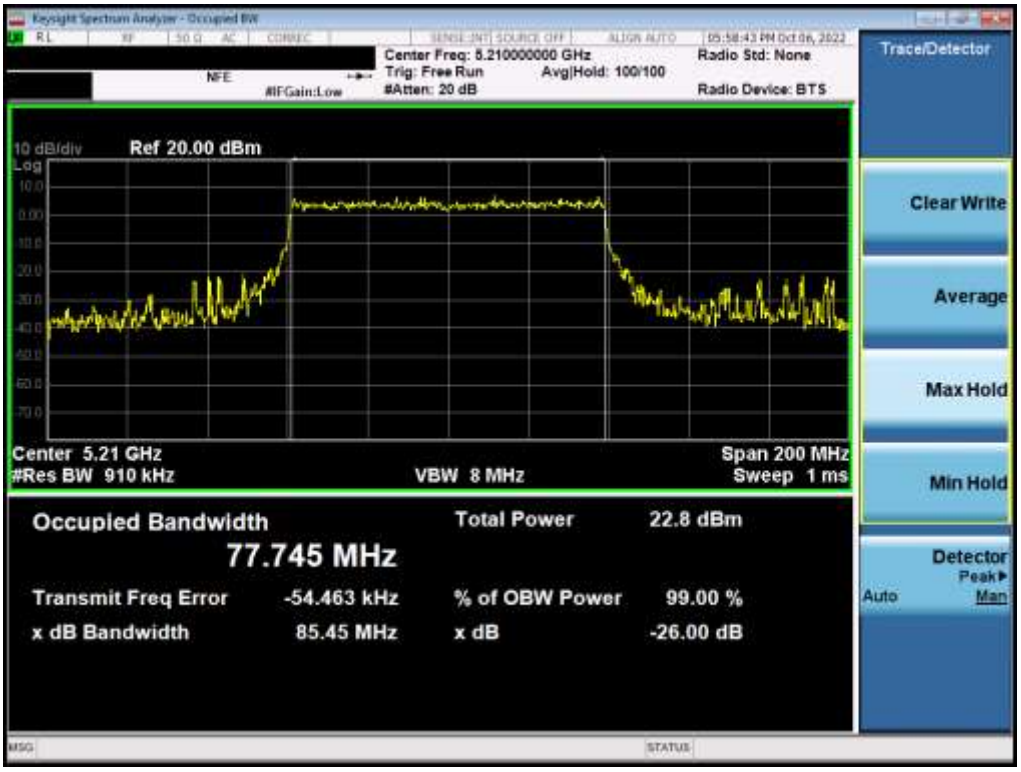
Plot 7-76. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 242 Tones (UNII Band 1) – Ch. 48)



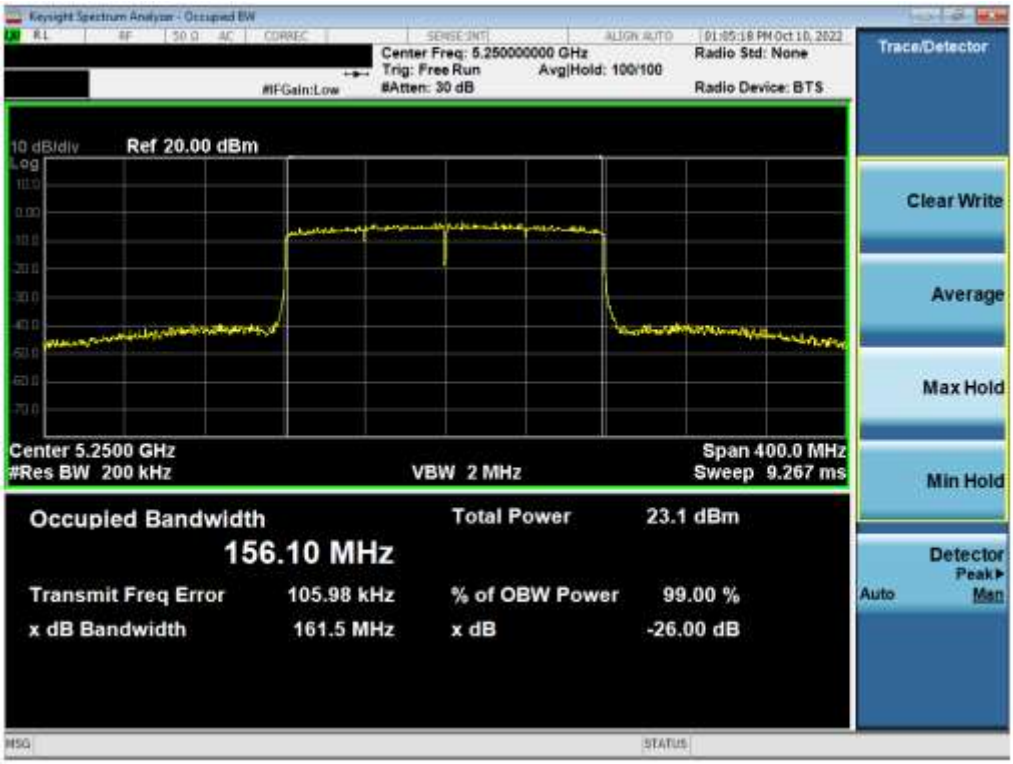
Plot 7-77. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax – 484 Tones (UNII Band 1) – Ch. 38)



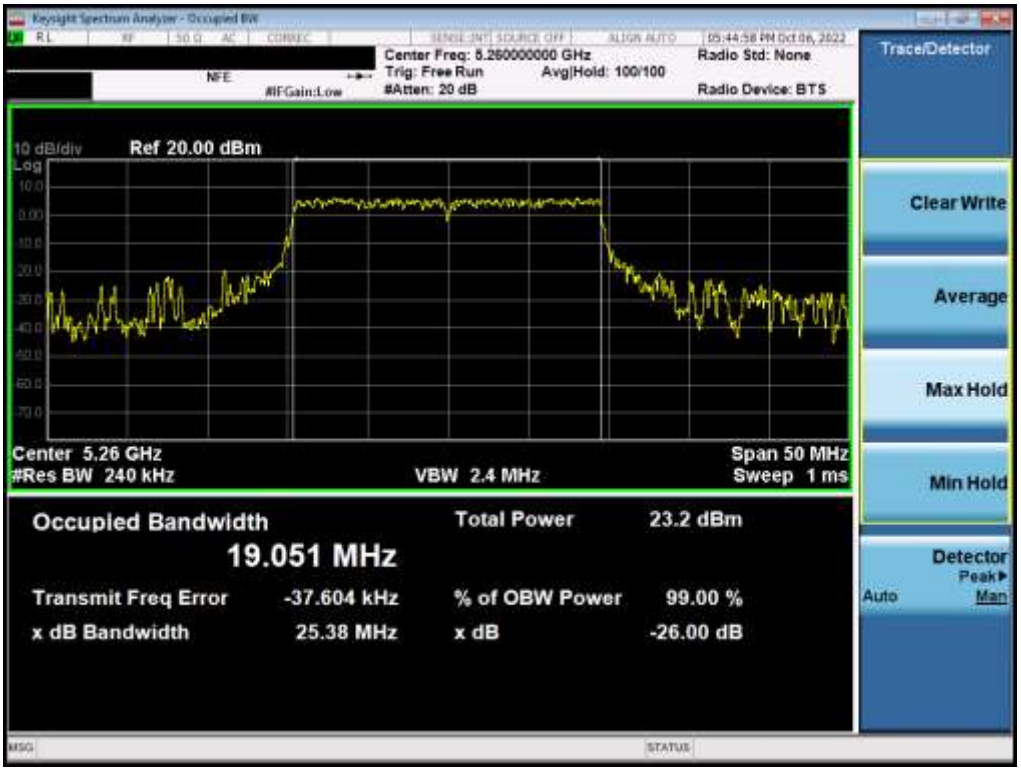
Plot 7-78. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax – 484 Tones (UNII Band 1) – Ch. 46)



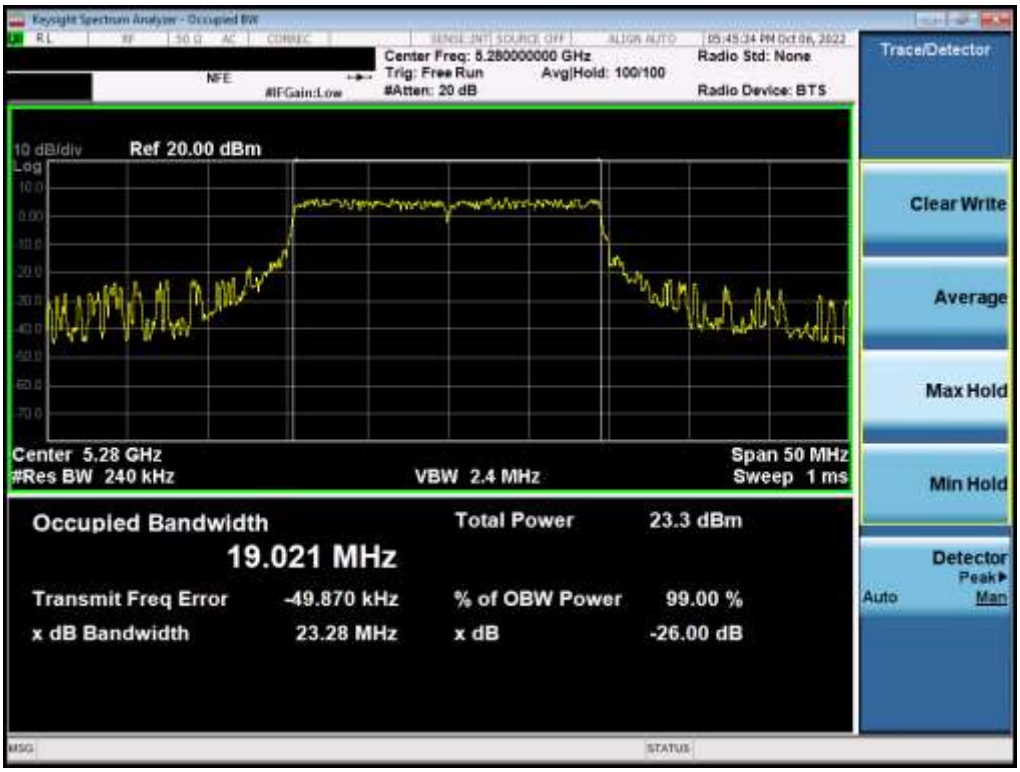
Plot 7-79. 26dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11ax – 996 Tones (UNII Band 1) – Ch. 42)



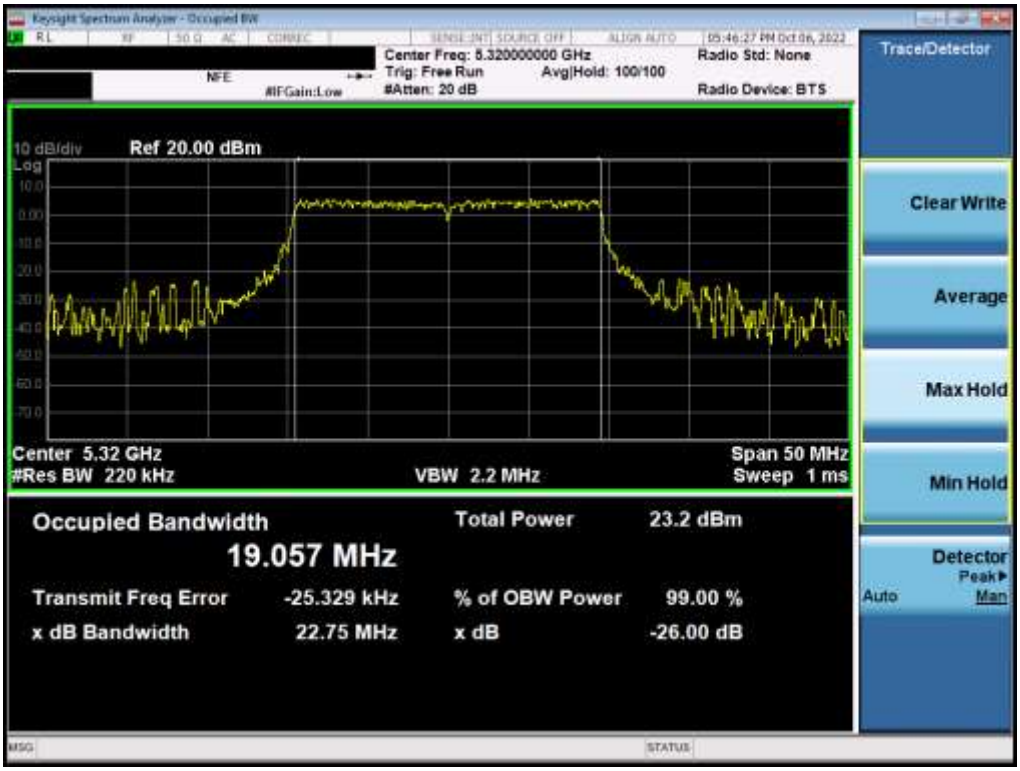
Plot 7-80. 26dB Bandwidth Plot MIMO ANT2 (160MHz BW 802.11ax – 996*2 Tones (UNII Band 1/2A) – Ch. 50)



Plot 7-81. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 242 Tones (UNII Band 2A) – Ch. 52)

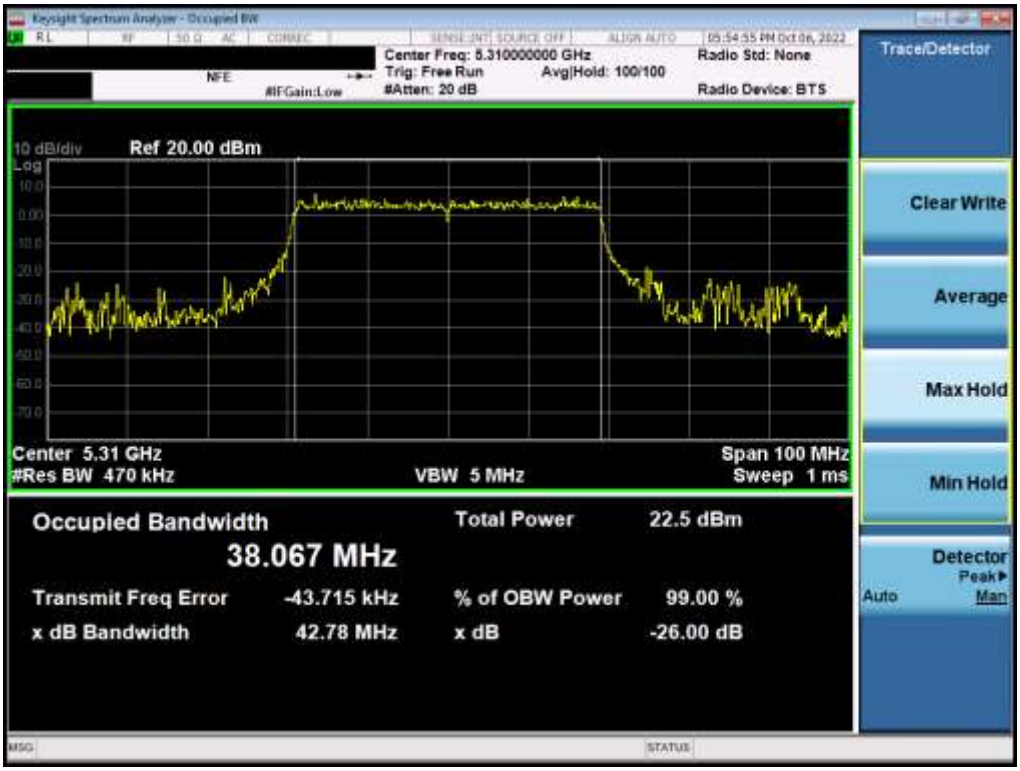


Plot 7-82. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 242 Tones (UNII Band 2A) – Ch. 56)

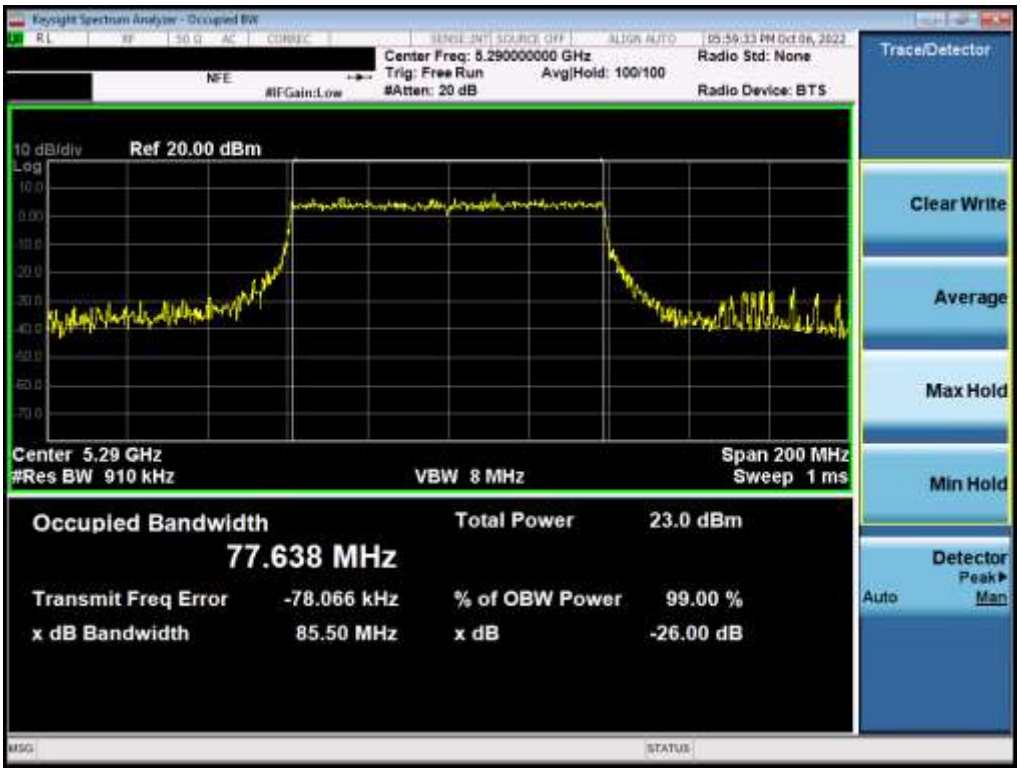


Plot 7-83. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 242 Tones (UNII Band 2A) – Ch. 64)

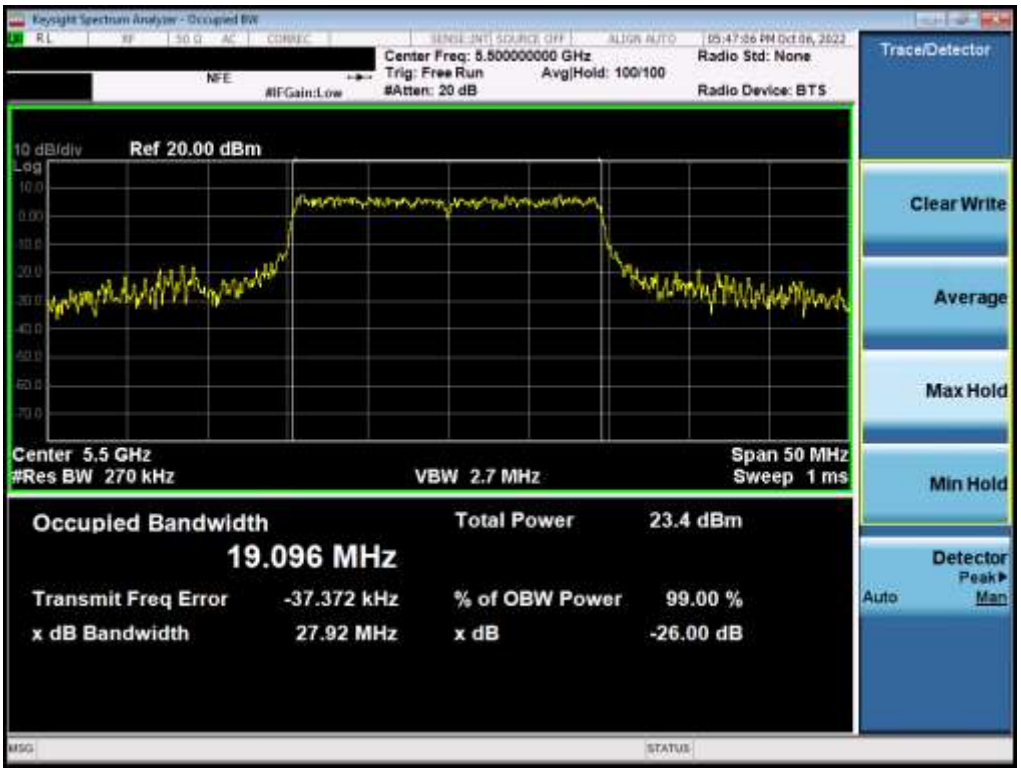
Plot 7-84. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax – 484 Tones (UNII Band 2A) – Ch. 54)



Plot 7-85. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax – 484 Tones (UNII Band 2A) – Ch. 62)

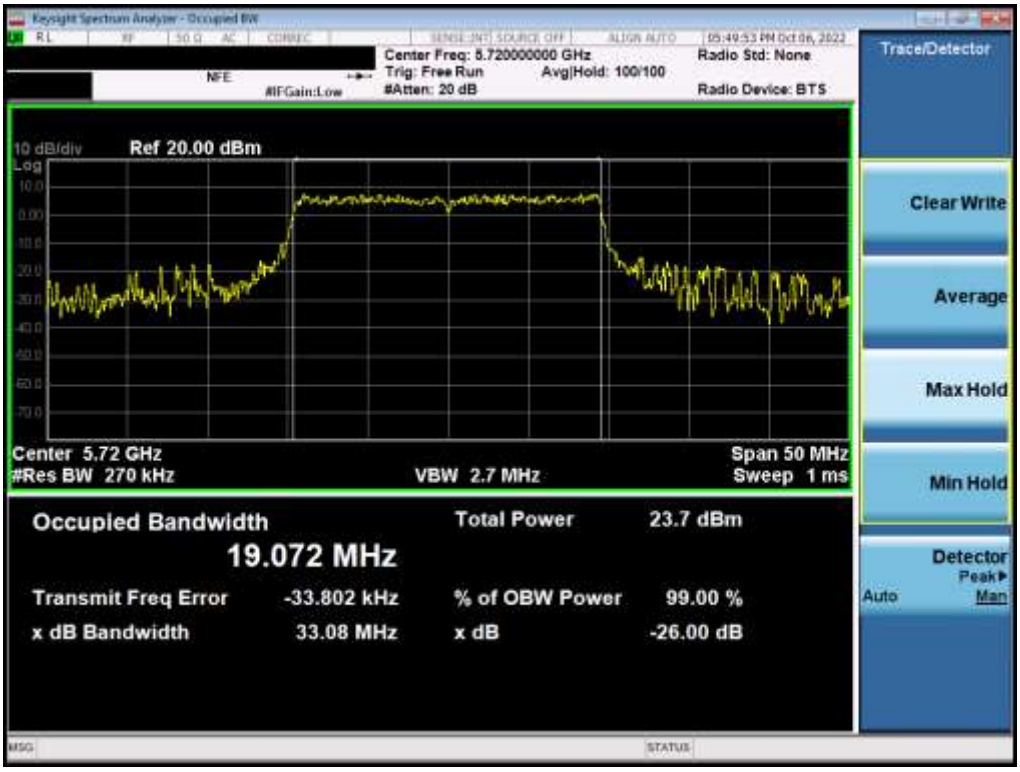


Plot 7-86. 26dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11ax – 996 Tones (UNII Band 2A) – Ch. 58)

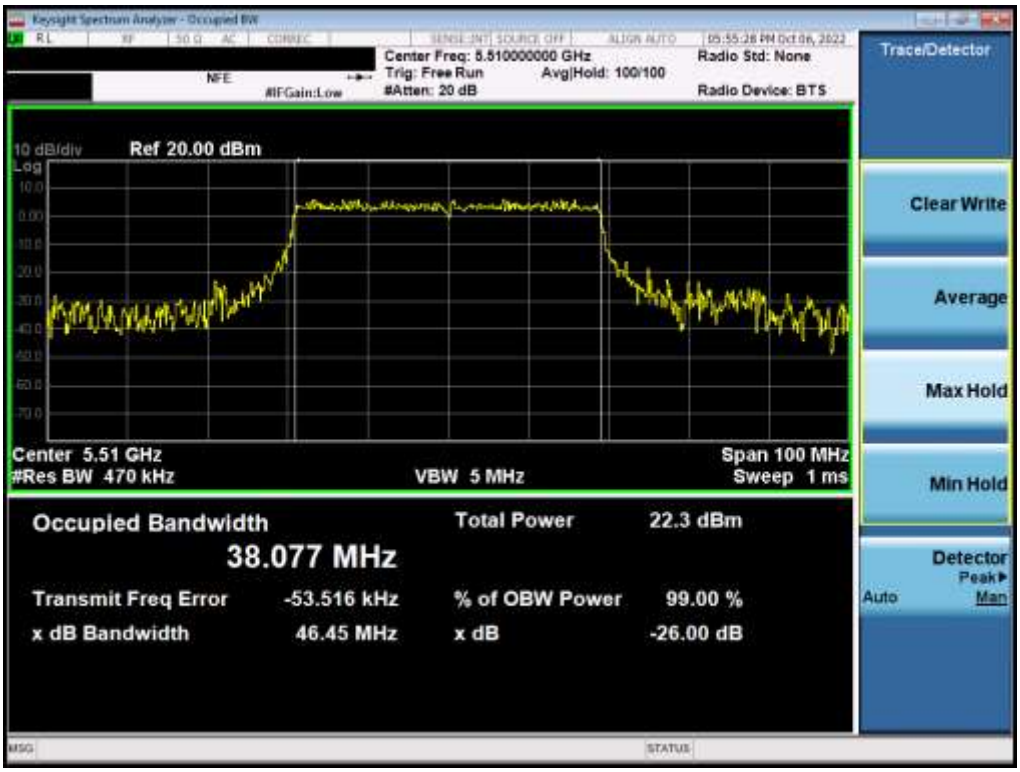


Plot 7-87. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 242 Tones (UNII Band 2C) – Ch. 100)

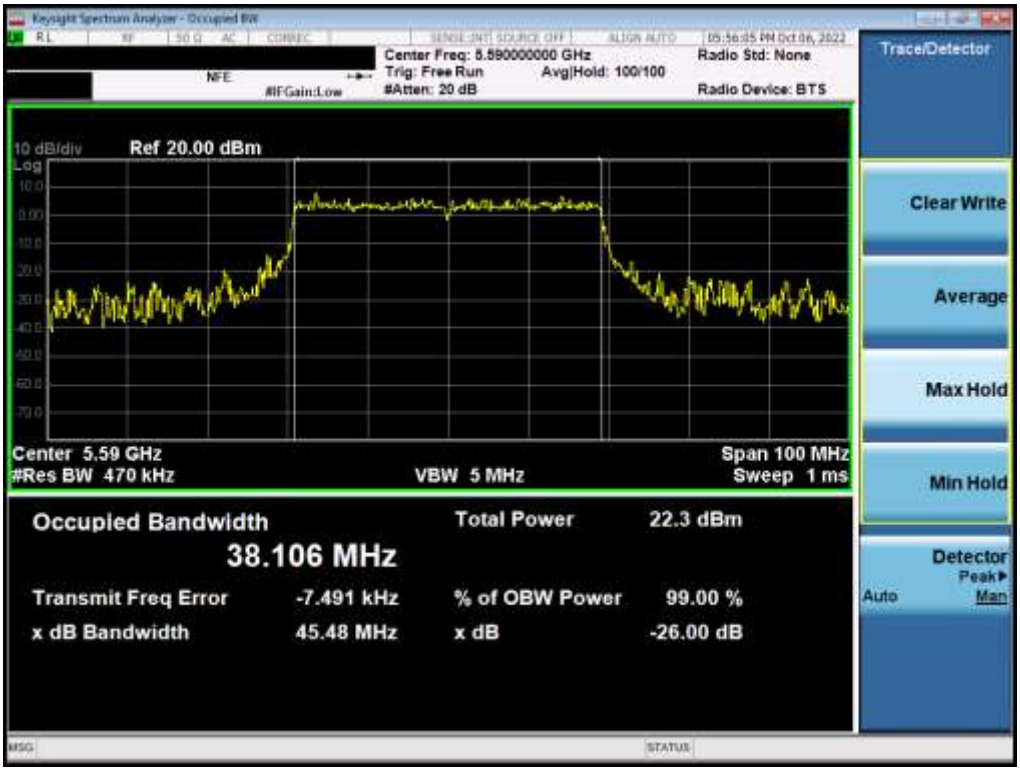
Plot 7-88. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 242 Tones (UNII Band 2C) – Ch. 120)



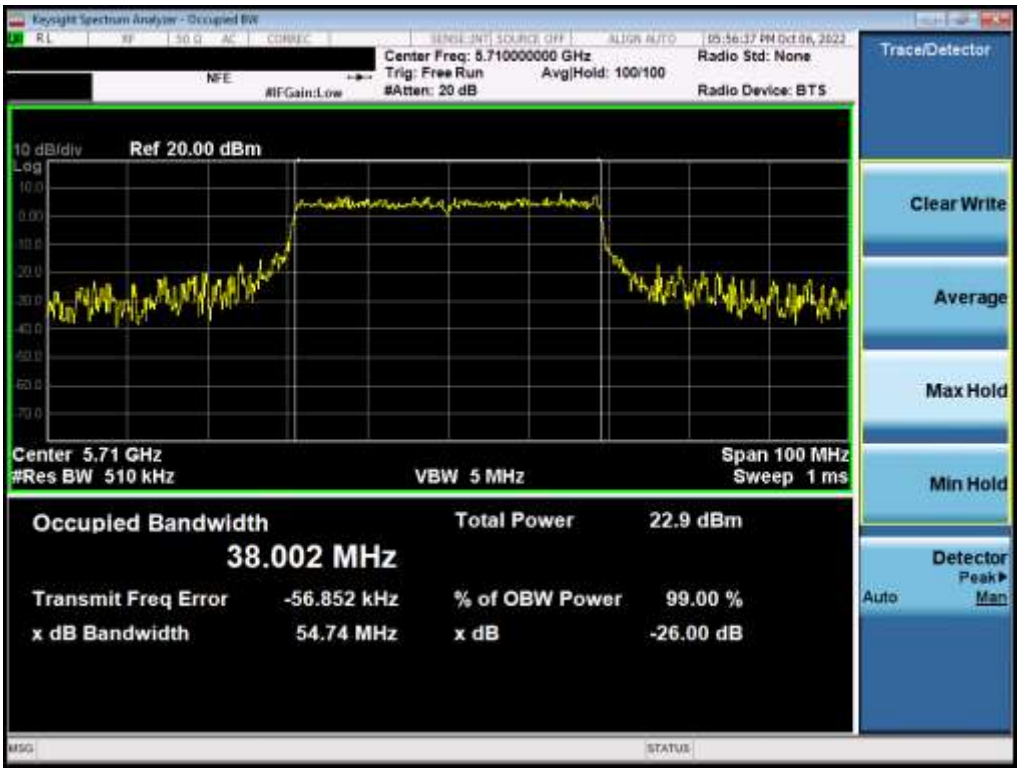
Plot 7-89. 26dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 242 Tones (UNII Band 2C) – Ch. 144)



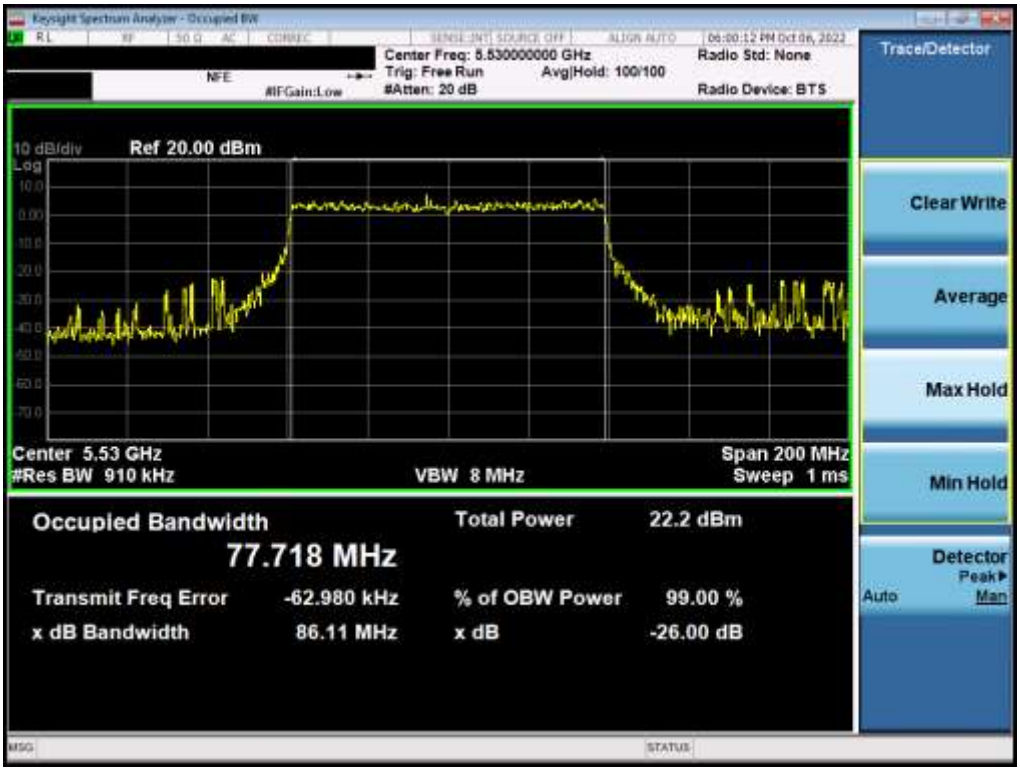
Plot 7-90. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax – 484 Tones (UNII Band 2C) – Ch. 102)



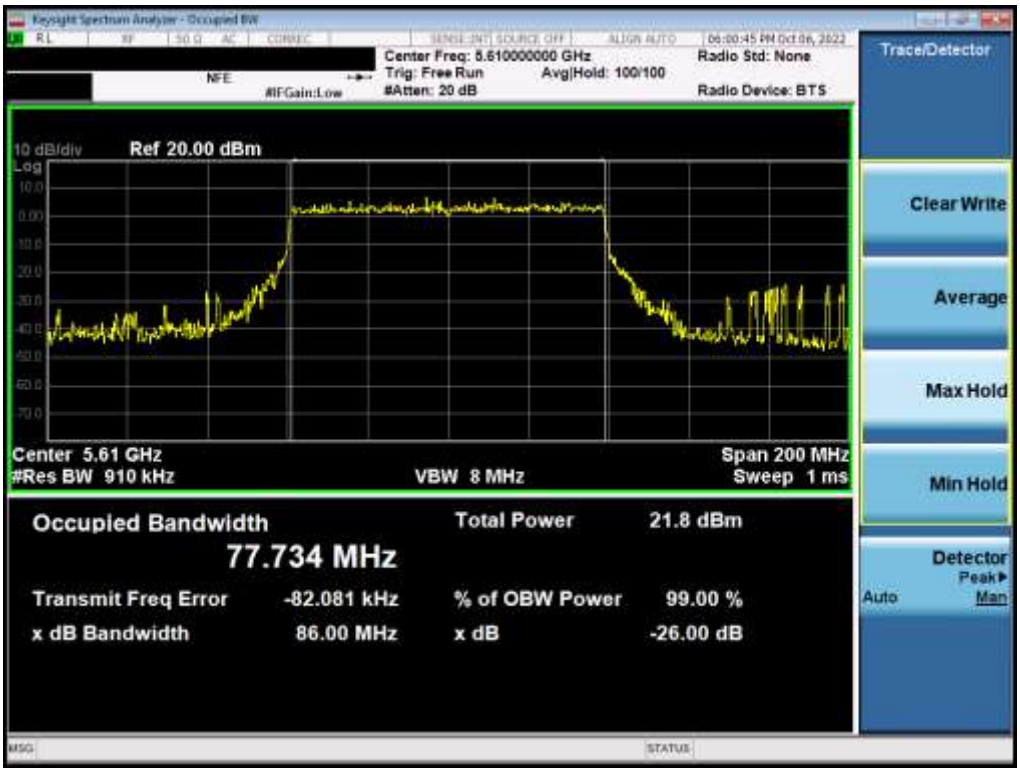
Plot 7-91. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax – 484 Tones (UNII Band 2C) – Ch. 118)



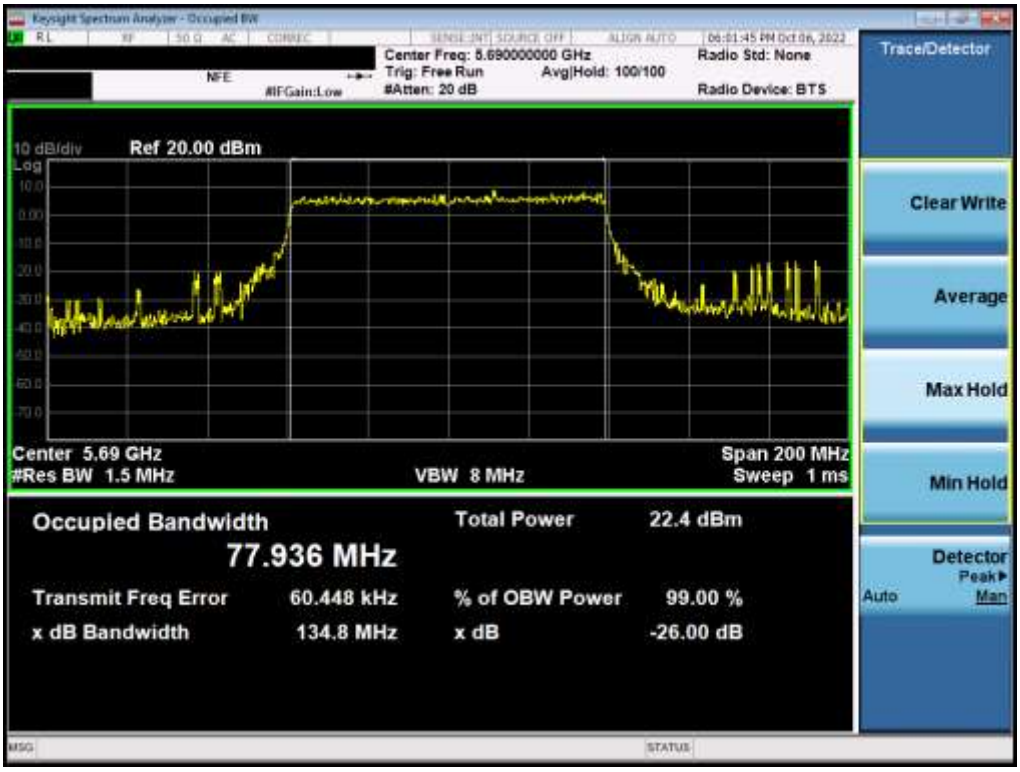
Plot 7-92. 26dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax – 484 Tones (UNII Band 2C) – Ch. 142)



Plot 7-93. 26dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11ax – 996 Tones (UNII Band 2C) – Ch. 106)



Plot 7-94. 26dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11ax – 996 Tones (UNII Band 2C) – Ch. 122)



Plot 7-95. 26dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11ax – 996 Tones (UNII Band 2C) – Ch. 138)

Plot 7-96. 26dB Bandwidth Plot MIMO ANT2 (160MHz BW 802.11ax – 996*2 Tones (UNII Band 2C) – Ch. 114)

7.3 6dB Bandwidth Measurement – 802.11ax OFDMA

§15.407 (e); RSS-Gen [6.7]

Test Overview and Limit

The bandwidth at 6dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating at its maximum duty cycle, at its maximum power control level, as defined in ANSI C63.10-2013 and KDB 789033 D02 v02r01, and at the appropriate frequencies. The spectrum analyzer's bandwidth measurement function is configured to measure the 6dB bandwidth.

In the 5.725 – 5.850GHz and 5.850-5.895 bands, the 6dB bandwidth must be ≥ 500 kHz.

Test Procedure Used

ANSI C63.10-2013 – Section 6.9.2
KDB 789033 D02 v02r01 – Section C

Test Settings

1. The signal analyzers' automatic bandwidth measurement capability was used to perform the 6dB bandwidth measurement. The "X" dB bandwidth parameter was set to X = 6. The automatic bandwidth measurement function also has the capability of simultaneously measuring the 99% occupied bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 100 kHz
3. VBW ≥ 3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

Figure 7-2. Test Instrument & Measurement Setup

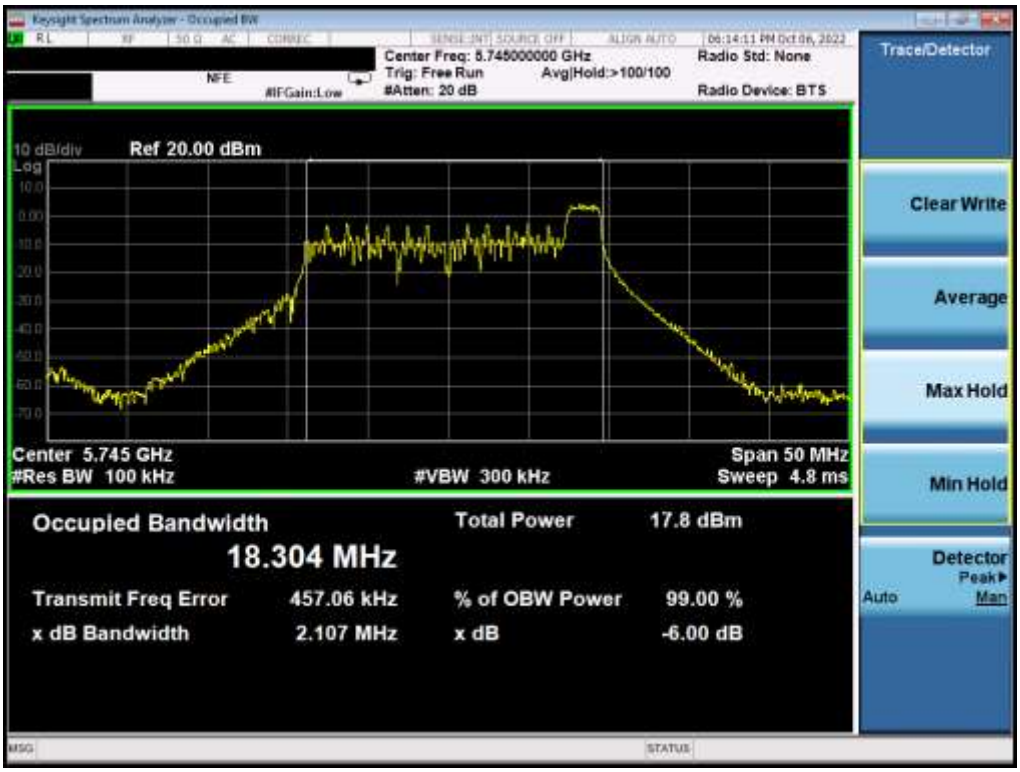
Test Notes

The 6dB Bandwidth measurement for each channel was measured with the RU index showing the highest conducted power.

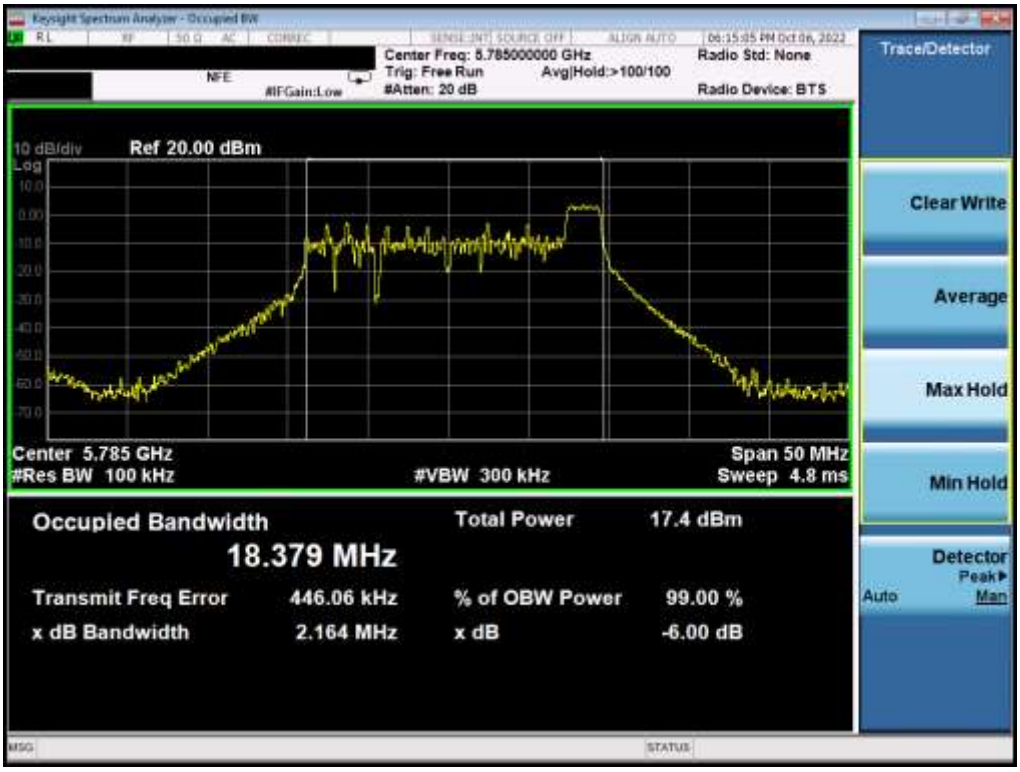
MIMO Antenna-1 6 dB Bandwidth Measurements (26 Tones)

	Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	Measured 6dB Bandwidth [MHz]
Band 3	5745	149	ax (20MHz)	26T	MCS0	2.11
	5785	157	ax (20MHz)	26T	MCS0	2.16
	5825	165	ax (20MHz)	26T	MCS0	2.15
	5755	151	ax (40MHz)	26T	MCS0	2.20
	5795	159	ax (40MHz)	26T	MCS0	2.19
	5775	155	ax (80MHz)	26T	MCS0	2.29

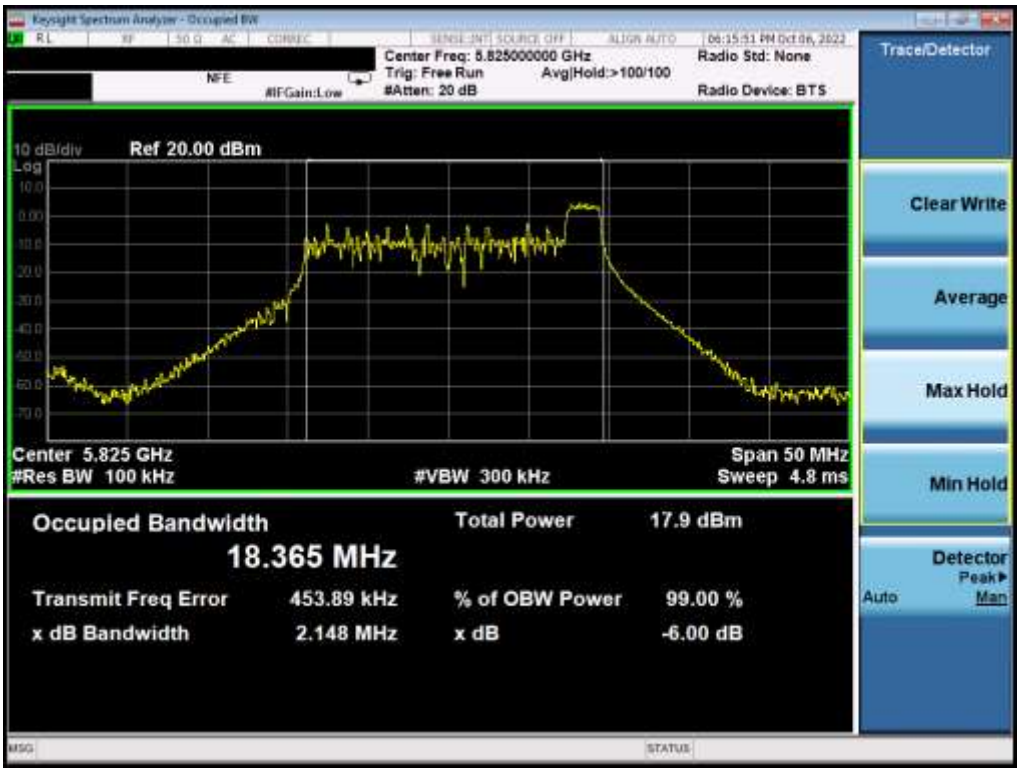
Table 7-6. Conducted Bandwidth Measurements MIMO ANT1 (26 Tones)



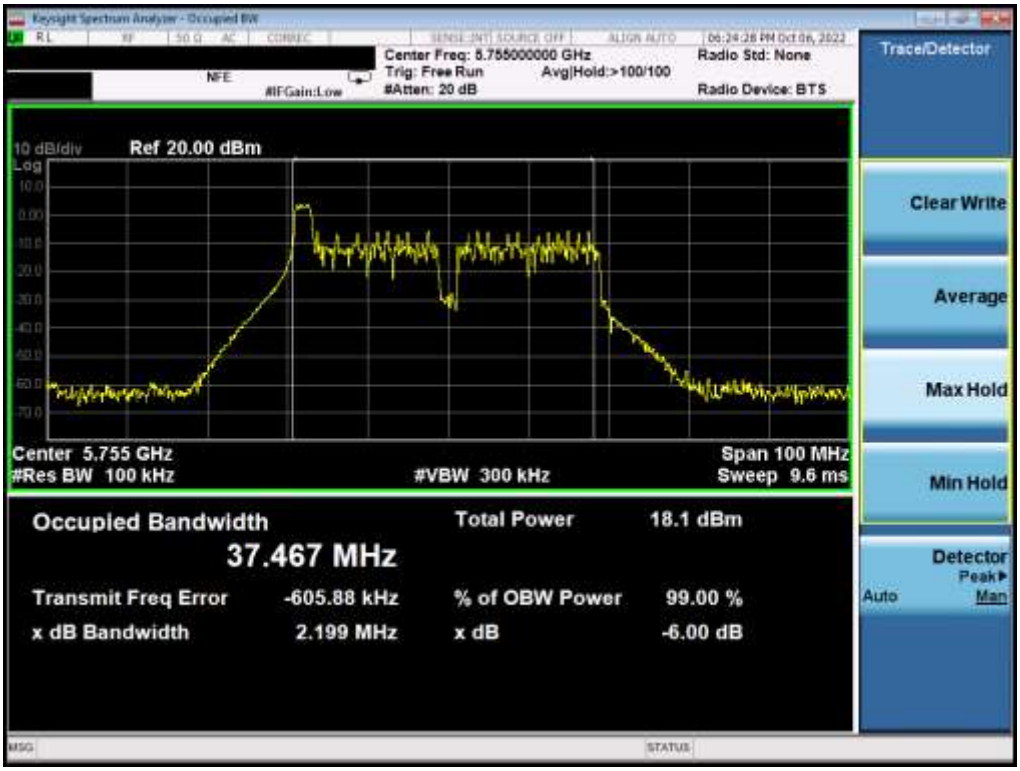
Plot 7-97. 6dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 149)



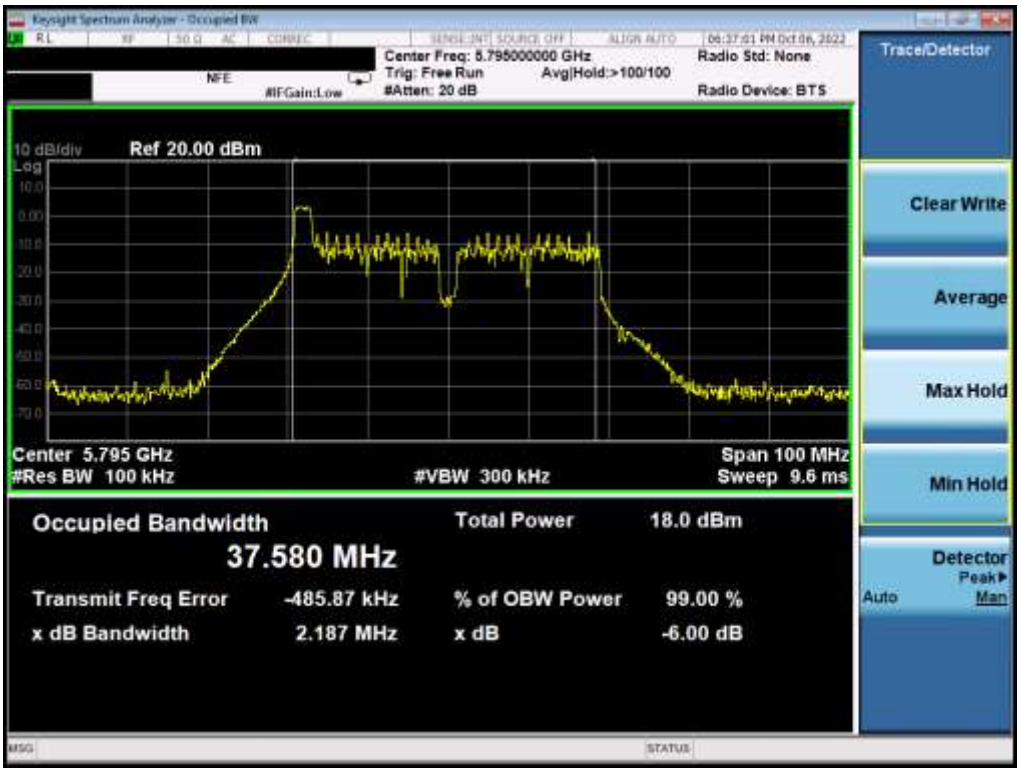
Plot 7-98. 6dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 157)



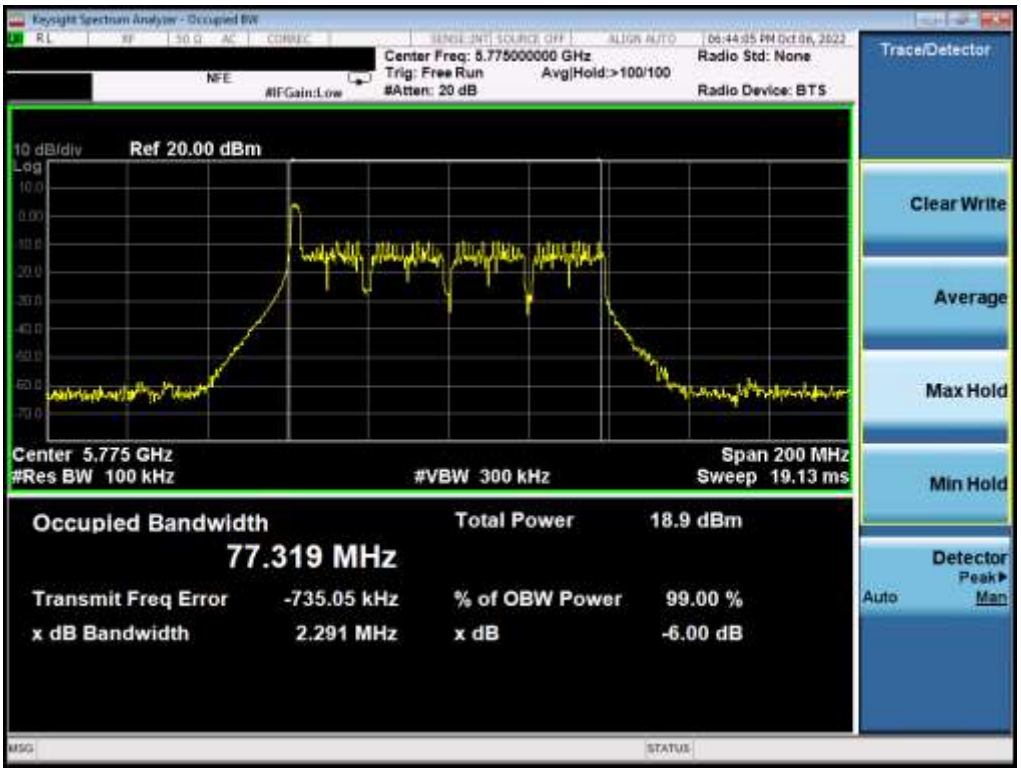
Plot 7-99. 6dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 165)



Plot 7-100. 6dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 151)



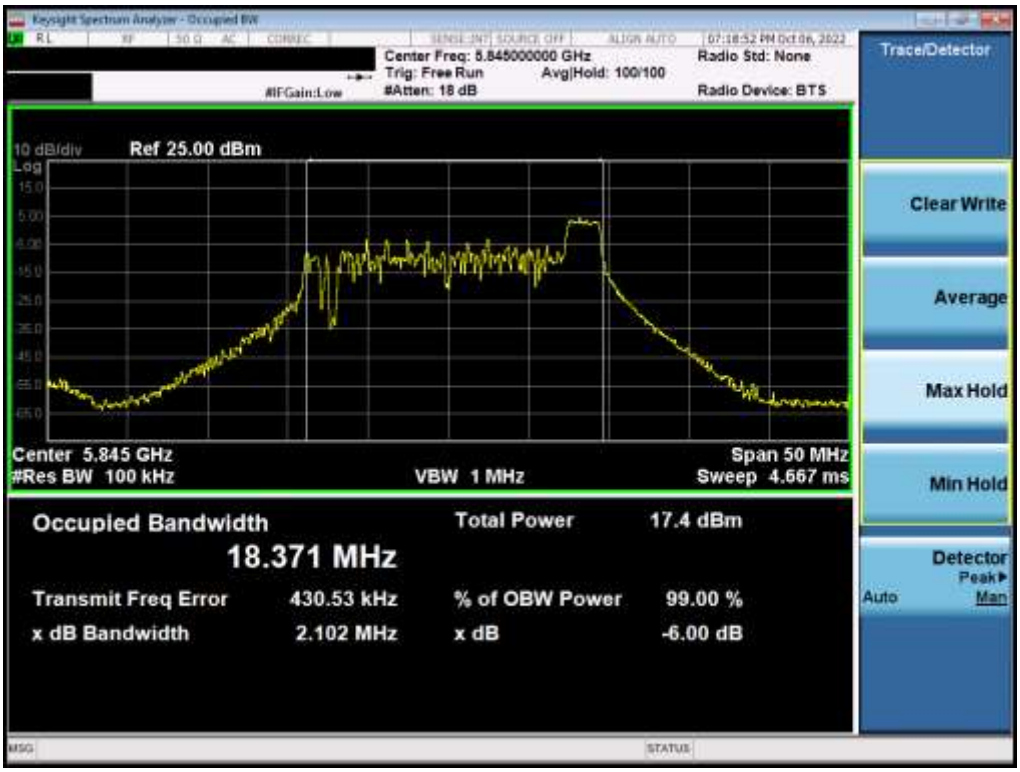
Plot 7-101. 6dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 159)



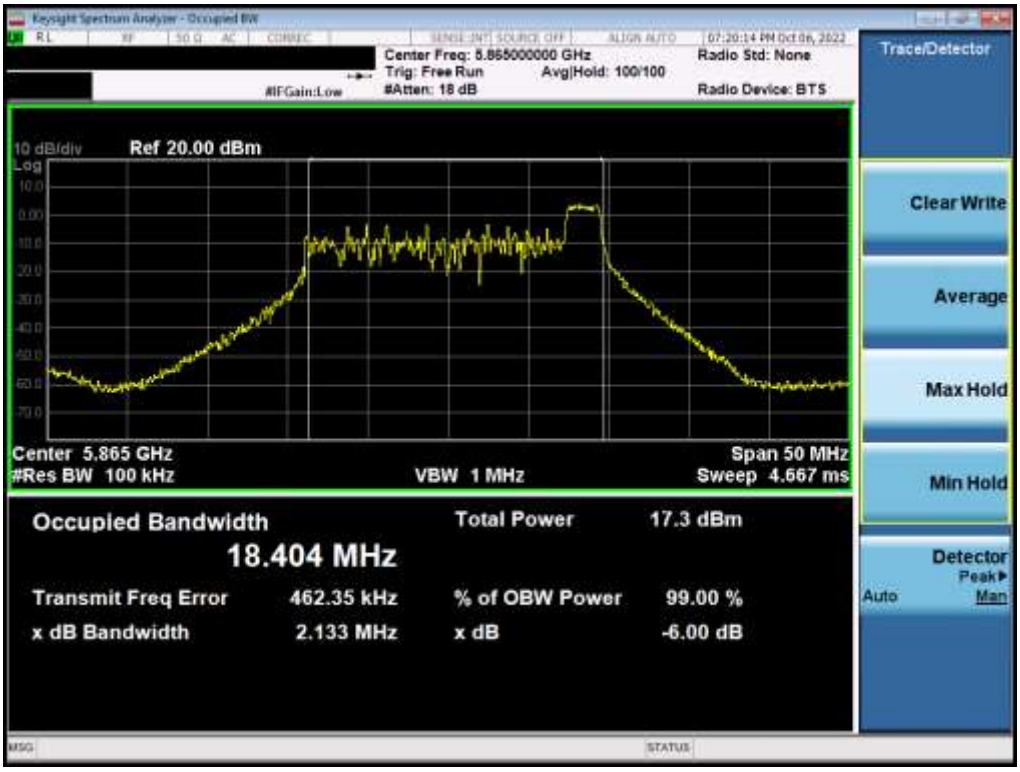
Plot 7-102. 6dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 155)

	Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	Measured 6dB Bandwidth [MHz]
Band 3/4	5845	169	ax (20MHz)	26T	MCS0	2.10
Band 4	5865	173	ax (20MHz)	26T	MCS0	2.13
	5885	177	ax (20MHz)	26T	MCS0	2.18
Band 3/4	5835	167	ax (40MHz)	26T	MCS0	2.16
Band 4	5875	175	ax (40MHz)	26T	MCS0	2.16
Band 3/4	5855	171	ax (80MHz)	26T	MCS0	2.84
	5815	163	ax (160MHz L)	26T	MCS0	3.51
	5815	163	ax (160MHz U)	26T	MCS0	3.01

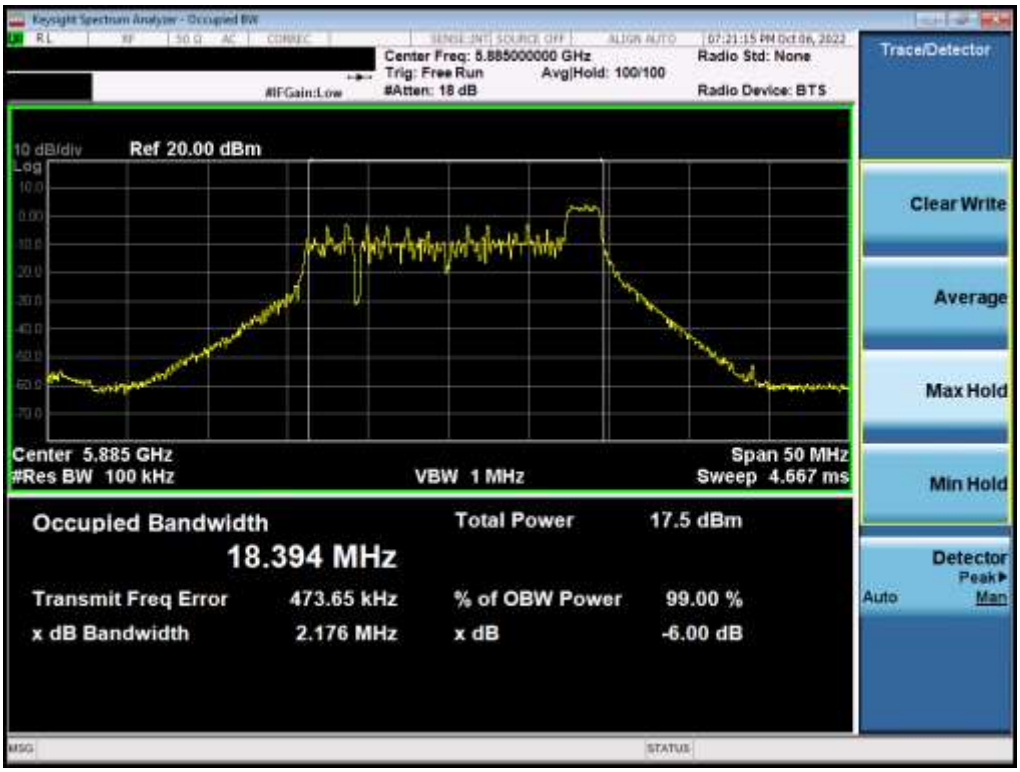
Table 7-7. Conducted Bandwidth Measurements MIMO ANT1 (26 Tones)



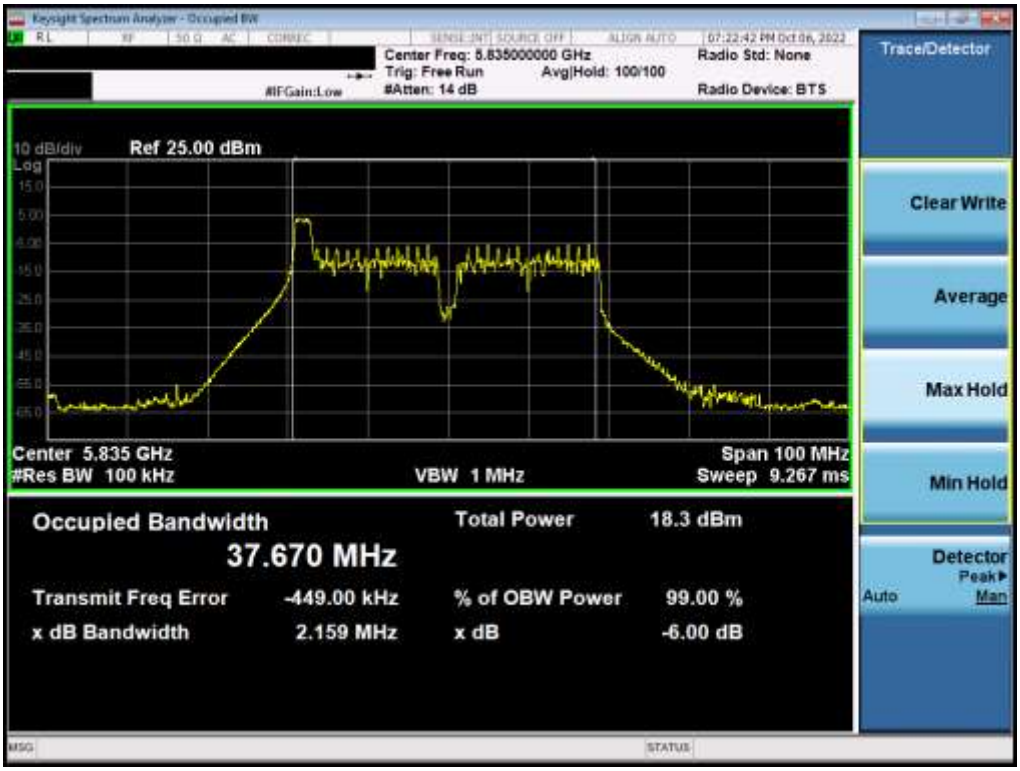
Plot 7-103. 6dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 26 Tones (UNII Band 3/4) – Ch. 169)



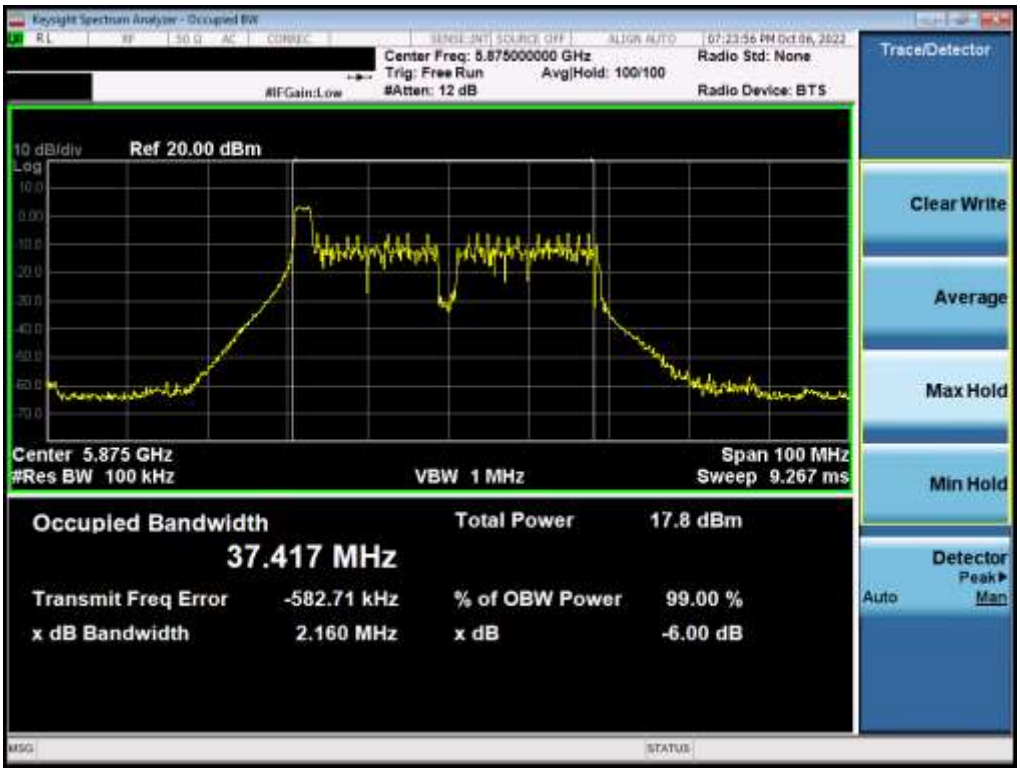
Plot 7-104. 6dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 173)



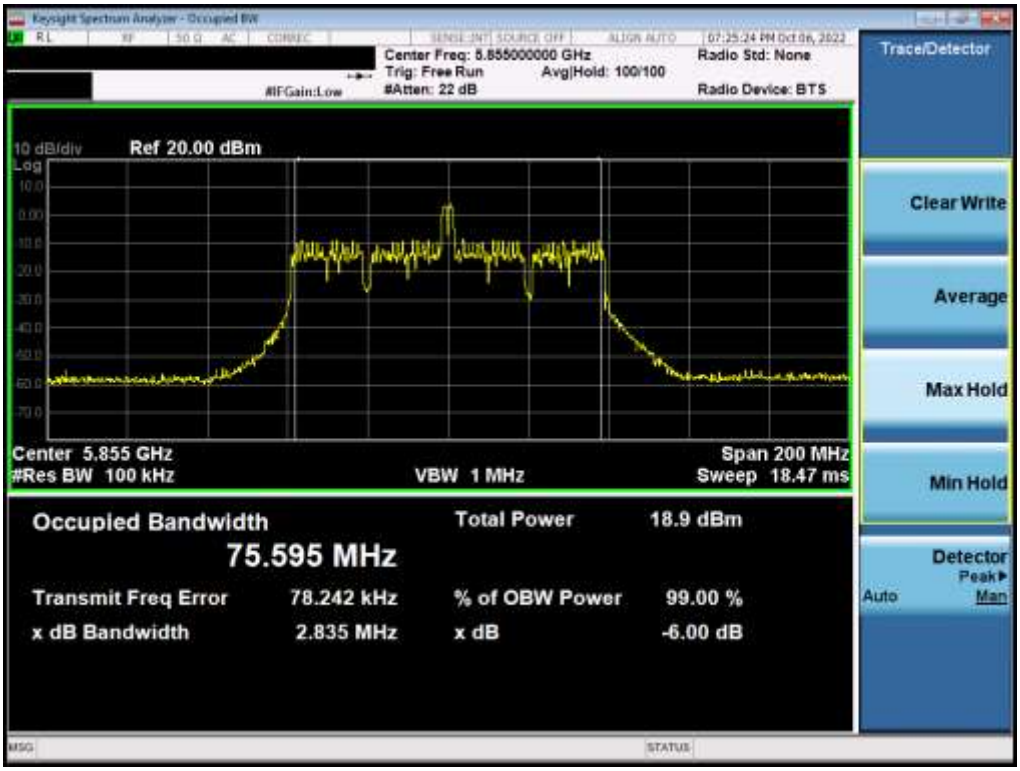
Plot 7-105. 6dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 177)



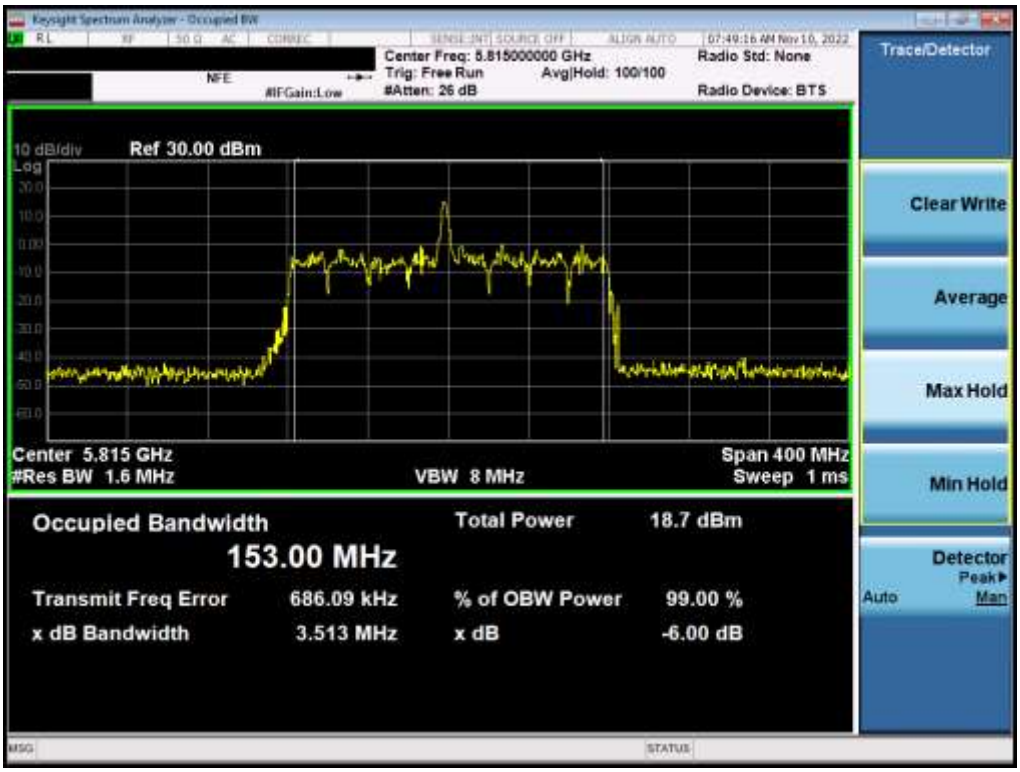
Plot 7-106. 6dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax – 26 Tones (UNII Band 3/4) – Ch. 167)



Plot 7-107. 6dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 175)



Plot 7-108. 6dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax – 26 Tones (UNII Band 3/4) – Ch. 171)



Plot 7-109. 6dB Bandwidth Plot MIMO ANT1 (160MHz(L) BW 802.11ax – 26 Tones (UNII Band 3/4) – Ch. 163)

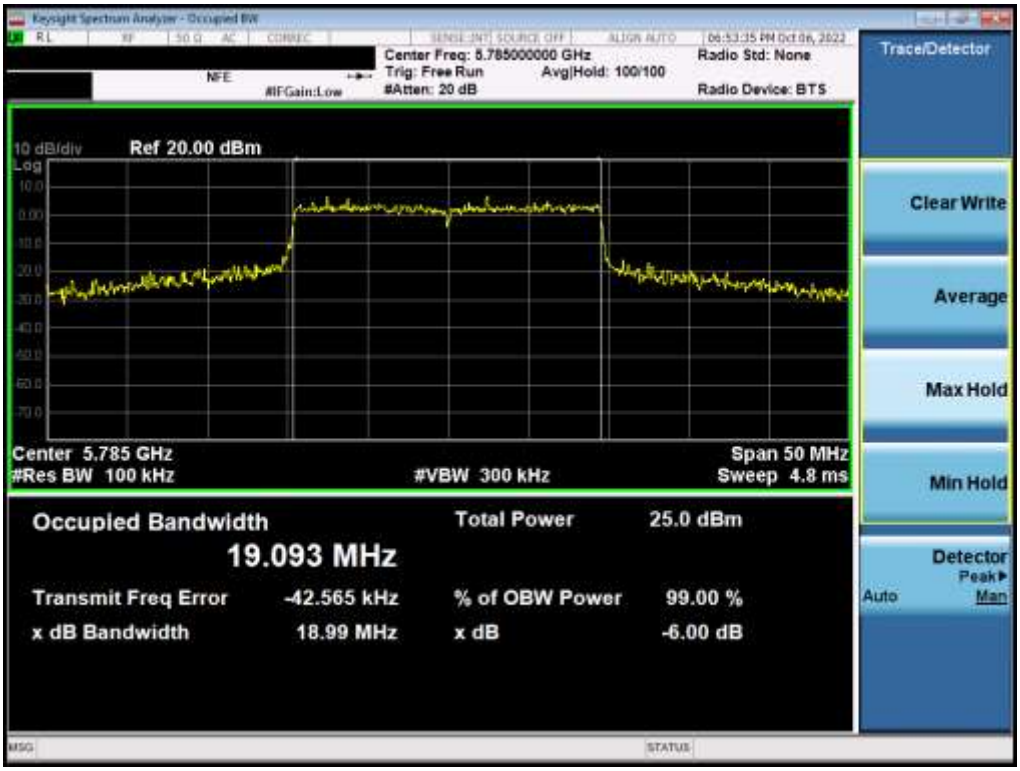
Plot 7-110. 6dB Bandwidth Plot MIMO ANT1 (160MHz(U) BW 802.11ax – 26 Tones (UNII Band 3/4) – Ch. 163)

MIMO Antenna-1 6 dB Bandwidth Measurements (Full Tones)

	Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	Measured 6dB Bandwidth [MHz]
Band 3	5745	149	ax (20MHz)	242T	MCS0	19.10
	5785	157	ax (20MHz)	242T	MCS0	18.99
	5825	165	ax (20MHz)	242T	MCS0	19.01
	5755	151	ax (40MHz)	484T	MCS0	38.12
	5795	159	ax (40MHz)	484T	MCS0	38.19
	5775	155	ax (80MHz)	996T	MCS0	78.21

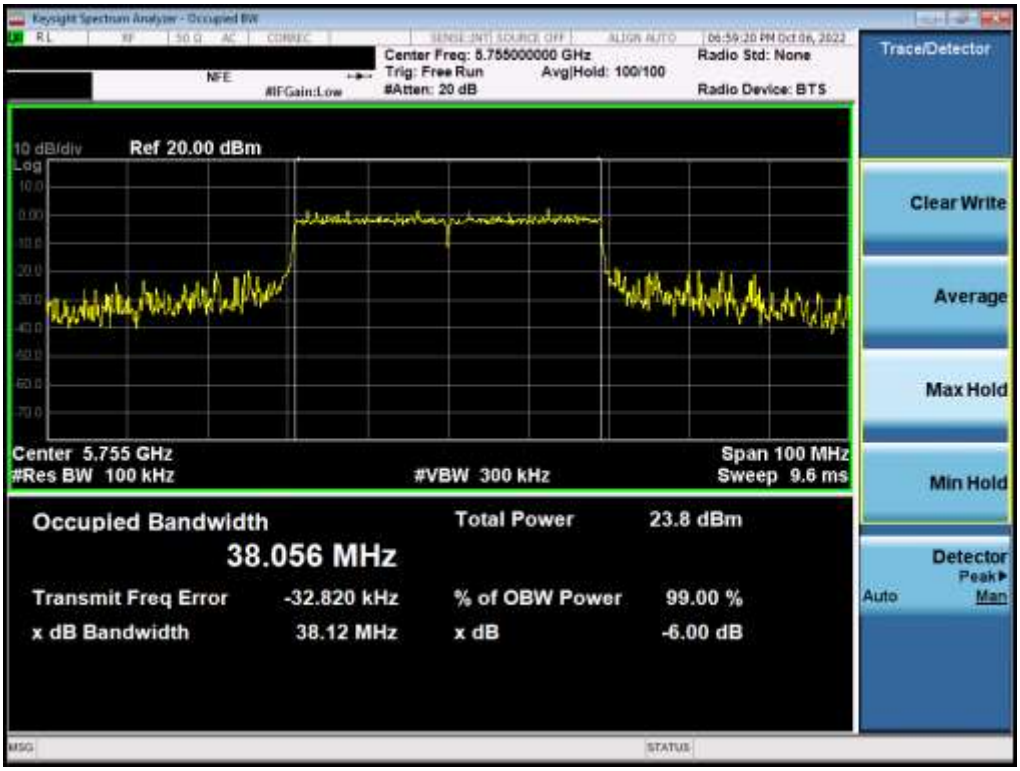
Table 7-8. Conducted Bandwidth Measurements MIMO ANT1 (Full Tones)

Plot 7-111. 6dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 242 Tones (UNII Band 3) – Ch. 149)

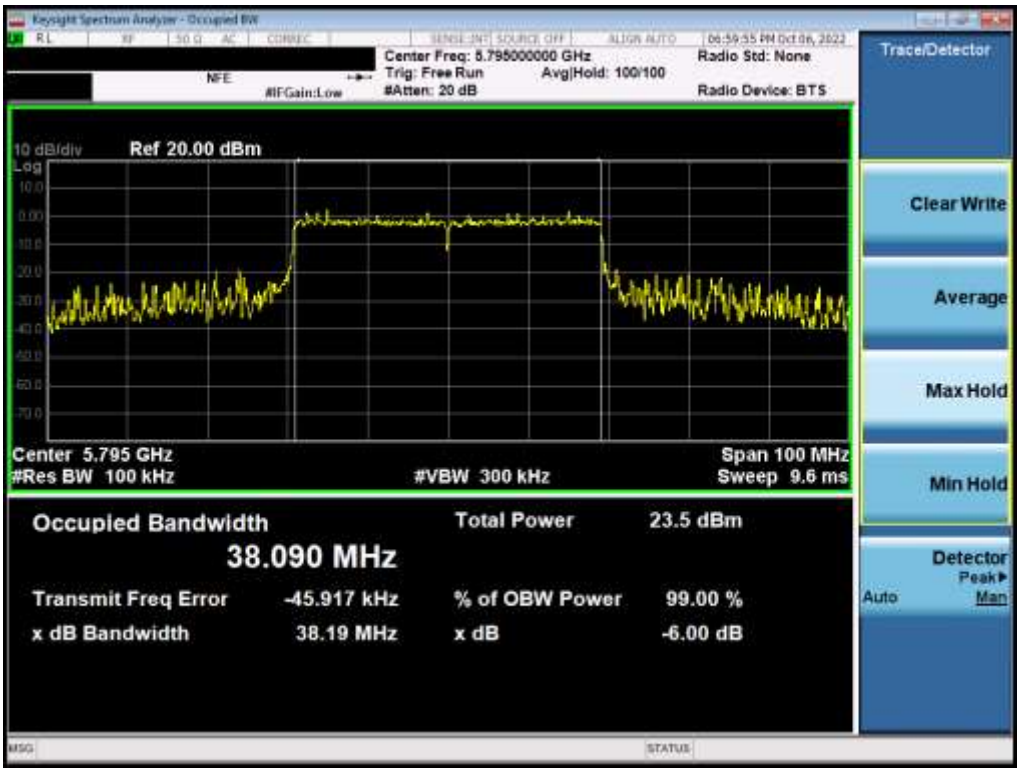


Plot 7-112. 6dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 242 Tones (UNII Band 3) – Ch. 157)

Plot 7-113. 6dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 242 Tones (UNII Band 3) – Ch. 165)



Plot 7-114. 6dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax – 484 Tones (UNII Band 3) – Ch. 151)

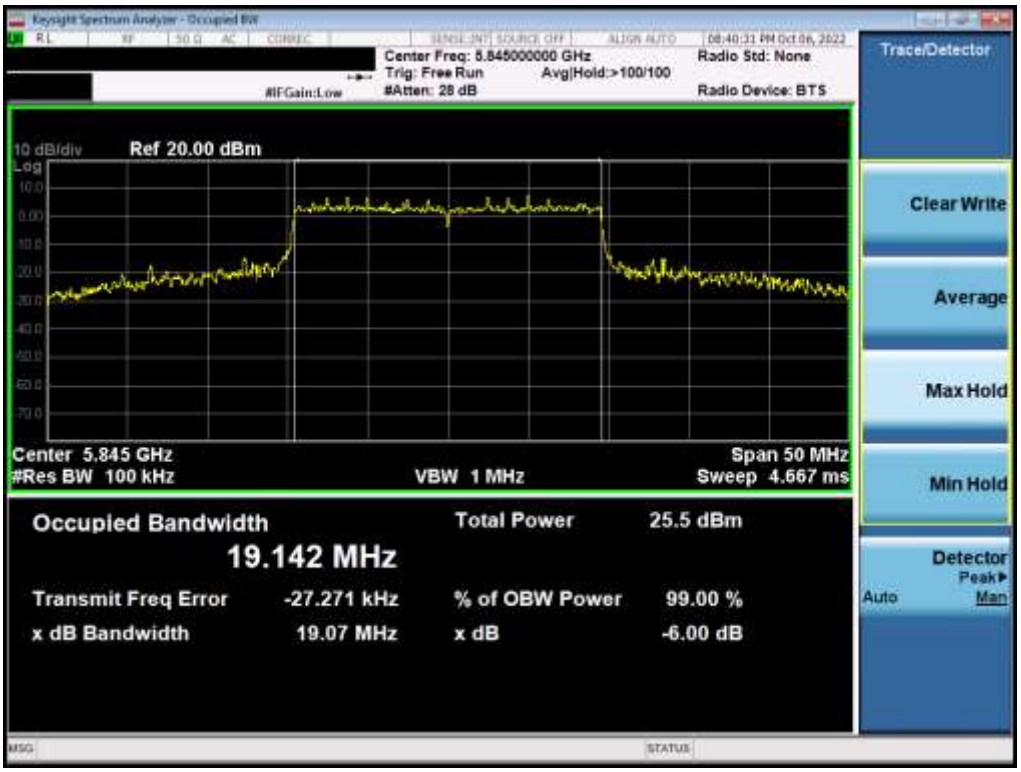


Plot 7-115. 6dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax – 484 Tones (UNII Band 3) – Ch. 159)

Plot 7-116. 6dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax – 996 Tones (UNII Band 3) – Ch. 155)

	Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	Measured 6dB Bandwidth [MHz]
Band 3/4	5845	169	ax (20MHz)	242T	MCS0	19.07
Band 4	5865	173	ax (20MHz)	242T	MCS0	19.08
	5885	177	ax (20MHz)	242T	MCS0	19.06
Band 3/4	5835	167	ax (40MHz)	484T	MCS0	38.10
Band 4	5875	175	ax (40MHz)	484T	MCS0	38.15
Band 3/4	5855	171	ax (80MHz)	996T	MCS0	78.22
	5815	163	ax (160MHz)	996T	MCS0	156.90

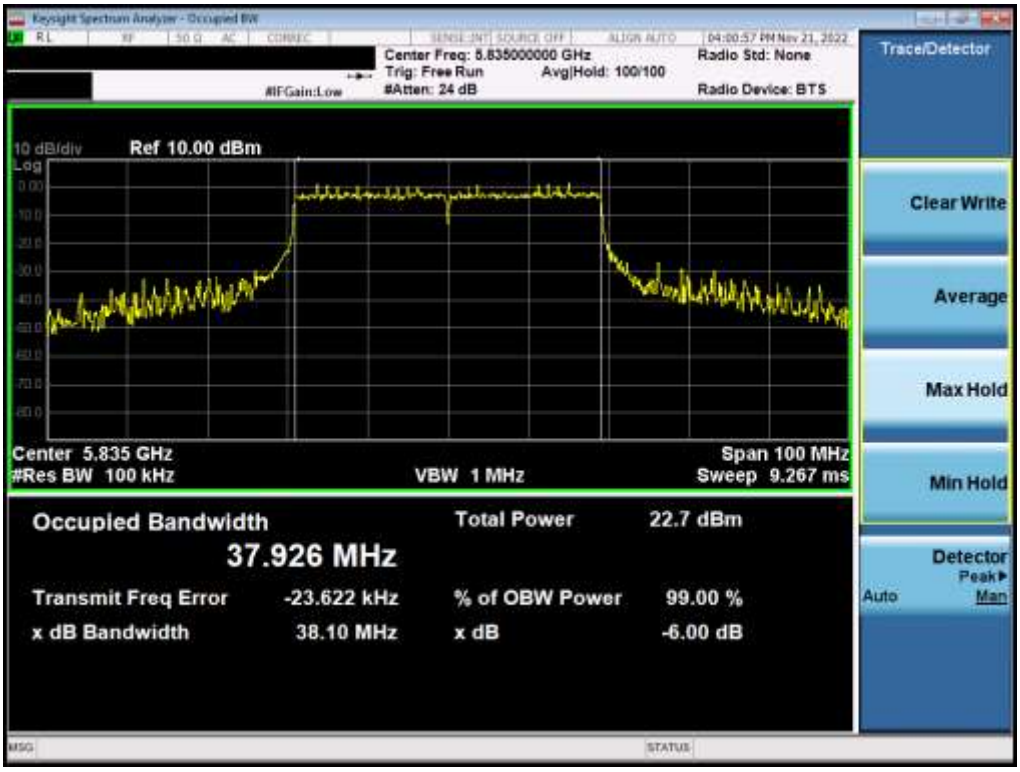
Table 7-9. Conducted Bandwidth Measurements MIMO ANT1 (Full Tones)



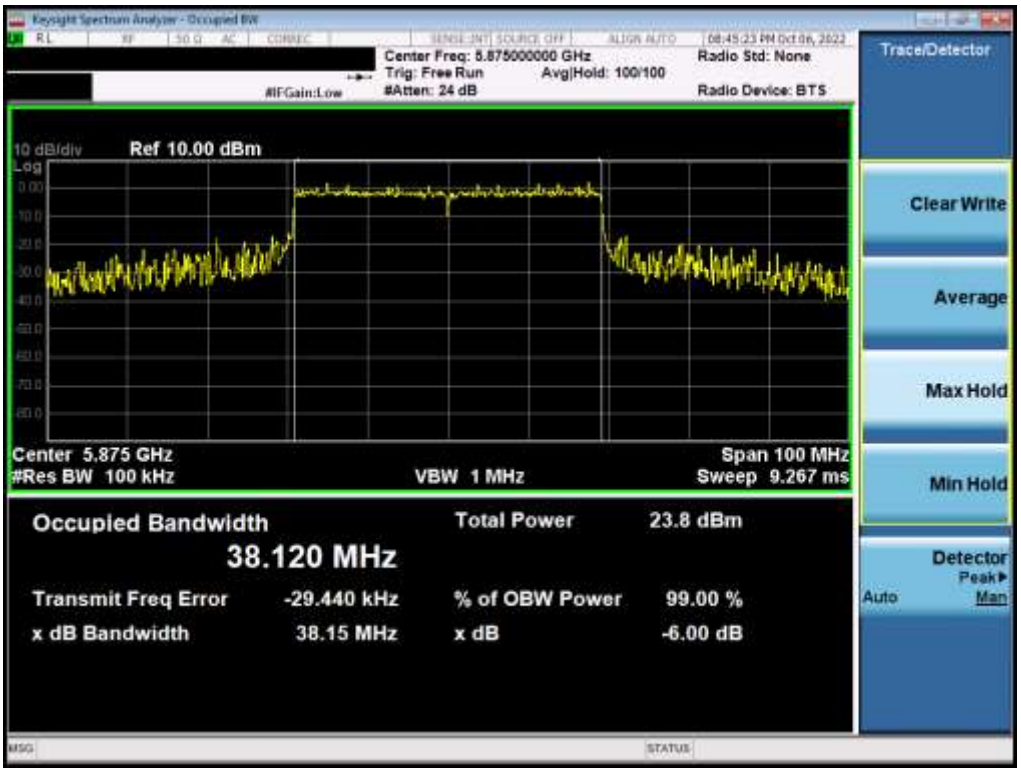
Plot 7-117. 6dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 242 Tones (UNII Band 3/4) – Ch. 169)

Plot 7-118. 6dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 242 Tones (UNII Band 3) – Ch. 173)

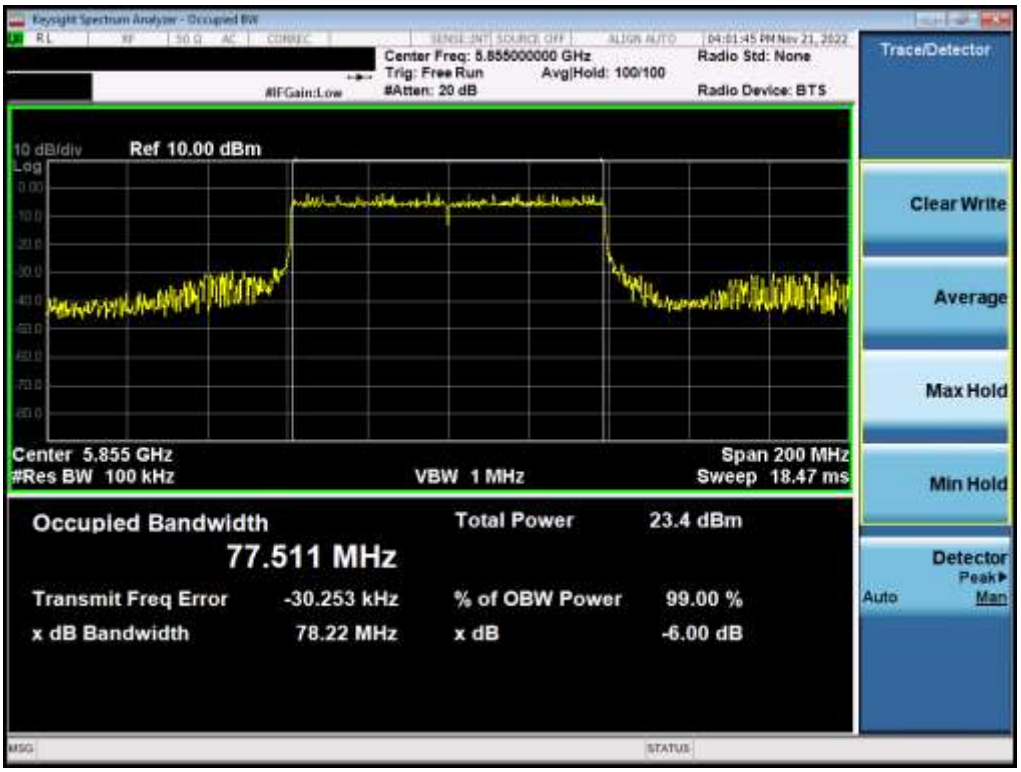
Plot 7-119. 6dB Bandwidth Plot MIMO ANT1 (20MHz BW 802.11ax – 242 Tones (UNII Band 3) – Ch. 177)



Plot 7-120. 6dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax – 484 Tones (UNII Band 3/4) – Ch. 167)



Plot 7-121. 6dB Bandwidth Plot MIMO ANT1 (40MHz BW 802.11ax – 484 Tones (UNII Band 3) – Ch. 175)



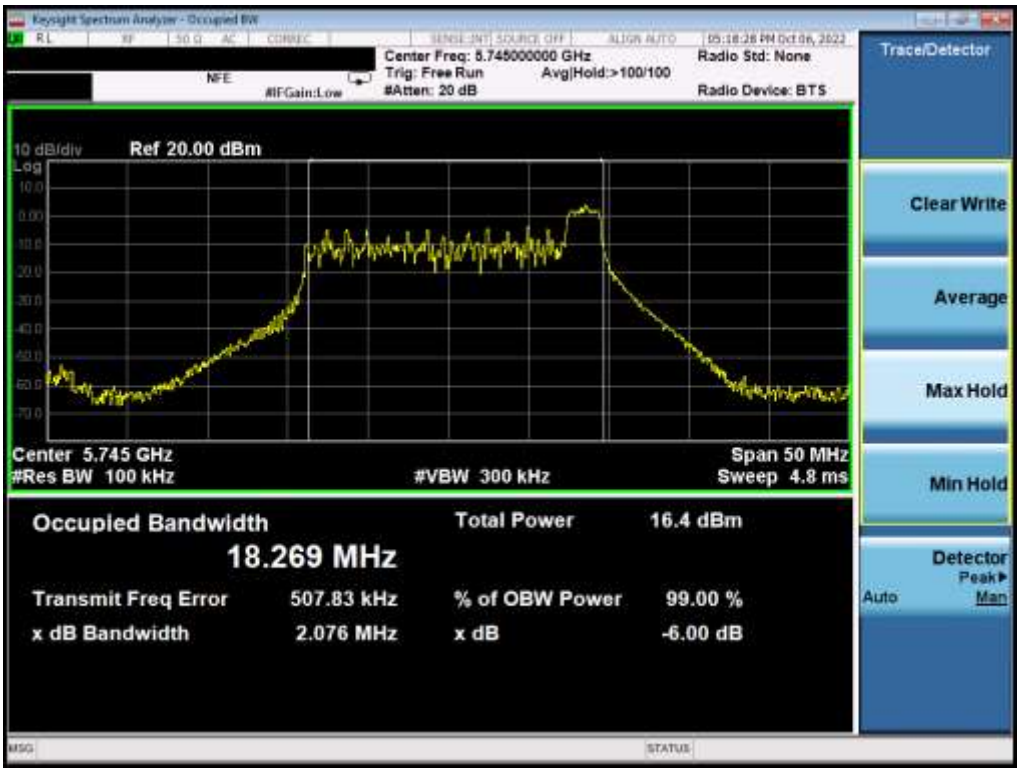
Plot 7-122. 6dB Bandwidth Plot MIMO ANT1 (80MHz BW 802.11ax – 996 Tones (UNII Band 3/4) – Ch. 171)

Plot 7-123. 6dB Bandwidth Plot MIMO ANT1 (160MHz BW 802.11ax – 996*2 Tones (UNII Band 3/4) – Ch. 163)

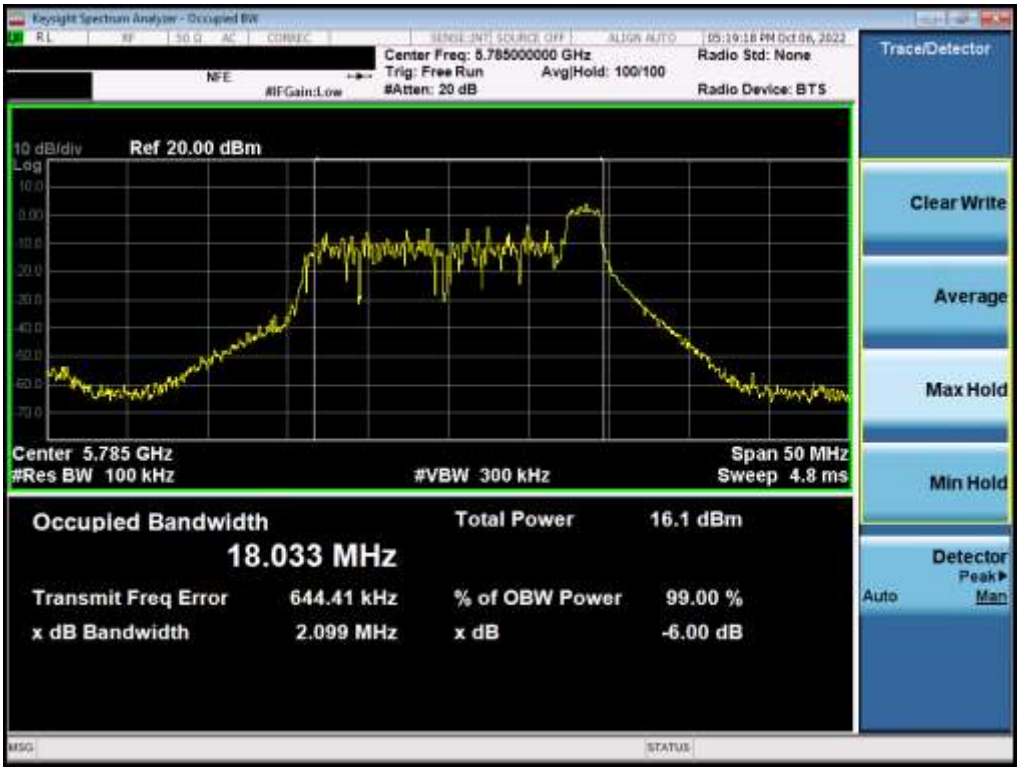
MIMO Antenna-2 6dB Bandwidth Measurements (26 Tones)

	Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	Measured 6dB Bandwidth [MHz]
Band 3	5745	149	ax (20MHz)	26T	MCS0	2.08
	5785	157	ax (20MHz)	26T	MCS0	2.10
	5825	165	ax (20MHz)	26T	MCS0	2.11
	5755	151	ax (40MHz)	26T	MCS0	2.20
	5795	159	ax (40MHz)	26T	MCS0	2.18
	5775	155	ax (80MHz)	26T	MCS0	2.87

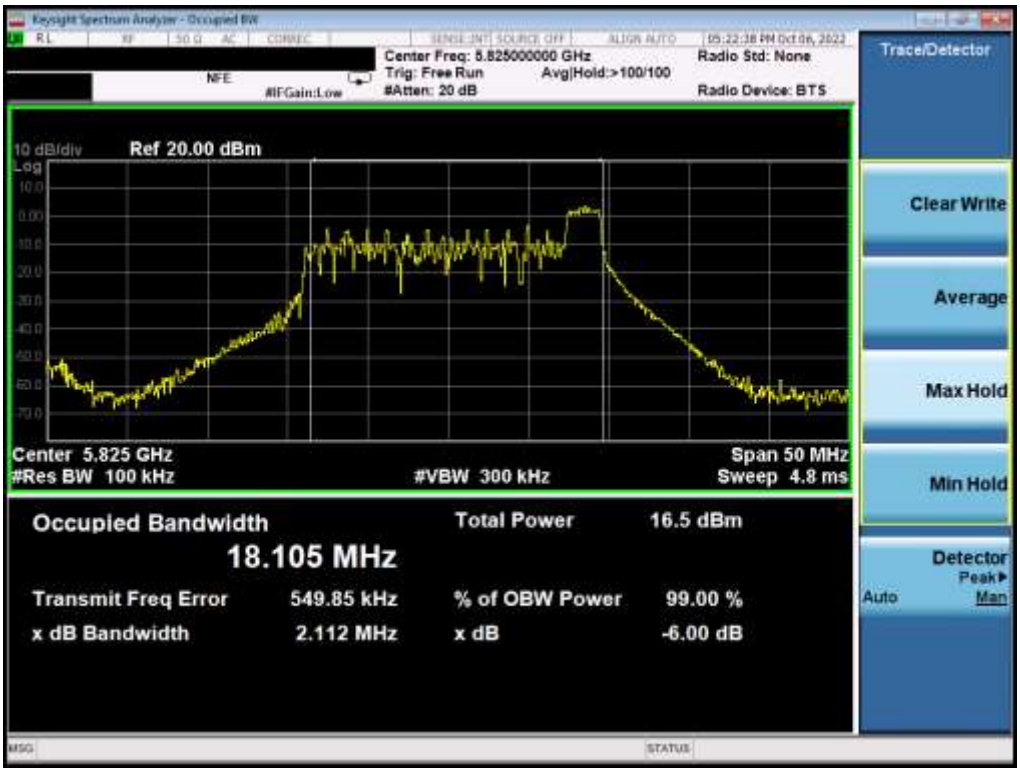
Table 7-10. Conducted Bandwidth Measurements MIMO ANT2 (26 Tones)



Plot 7-124. 6dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 149)

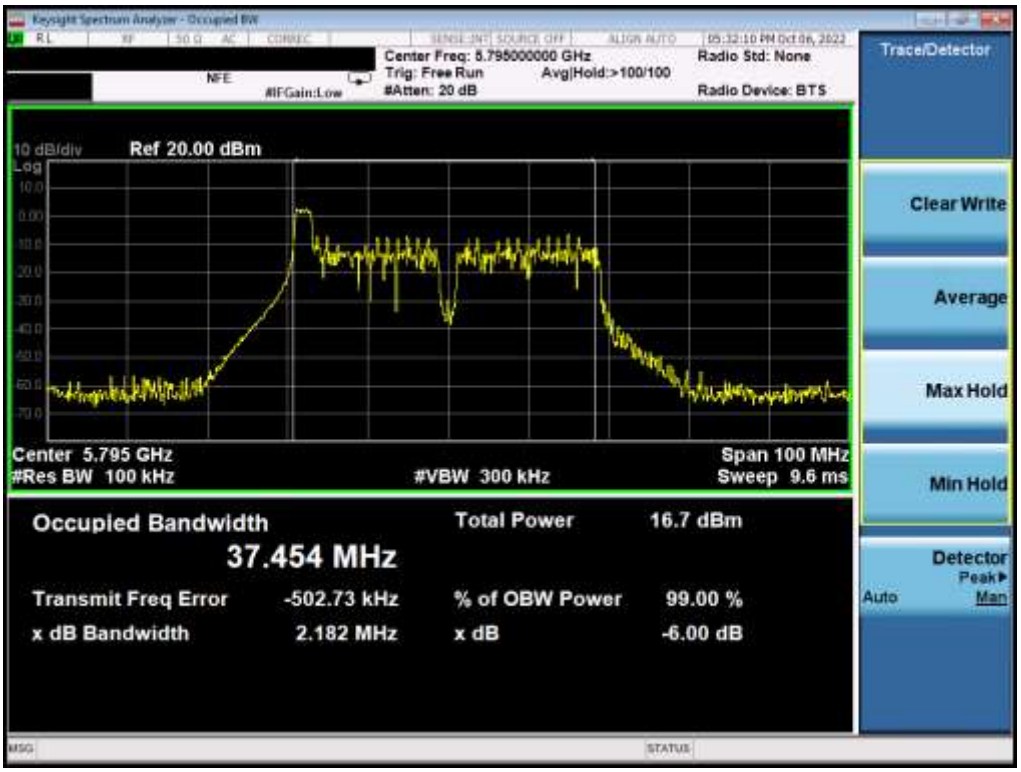


Plot 7-125. 6dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 157)

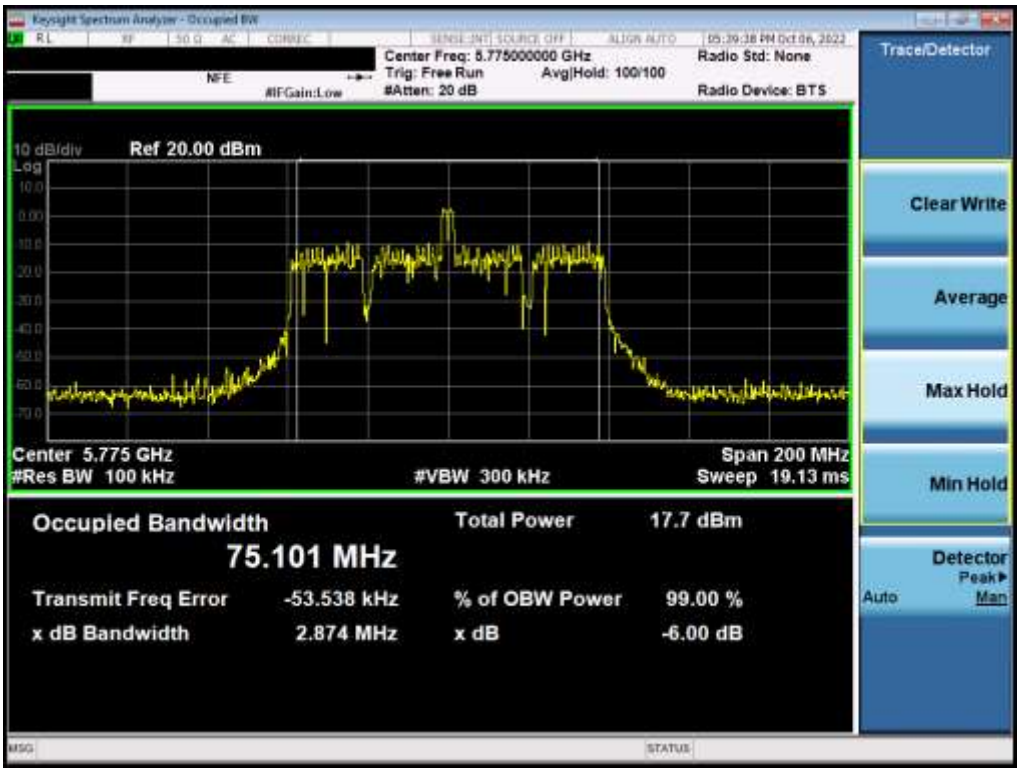


Plot 7-126. 6dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 165)

Plot 7-127. 6dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 151)



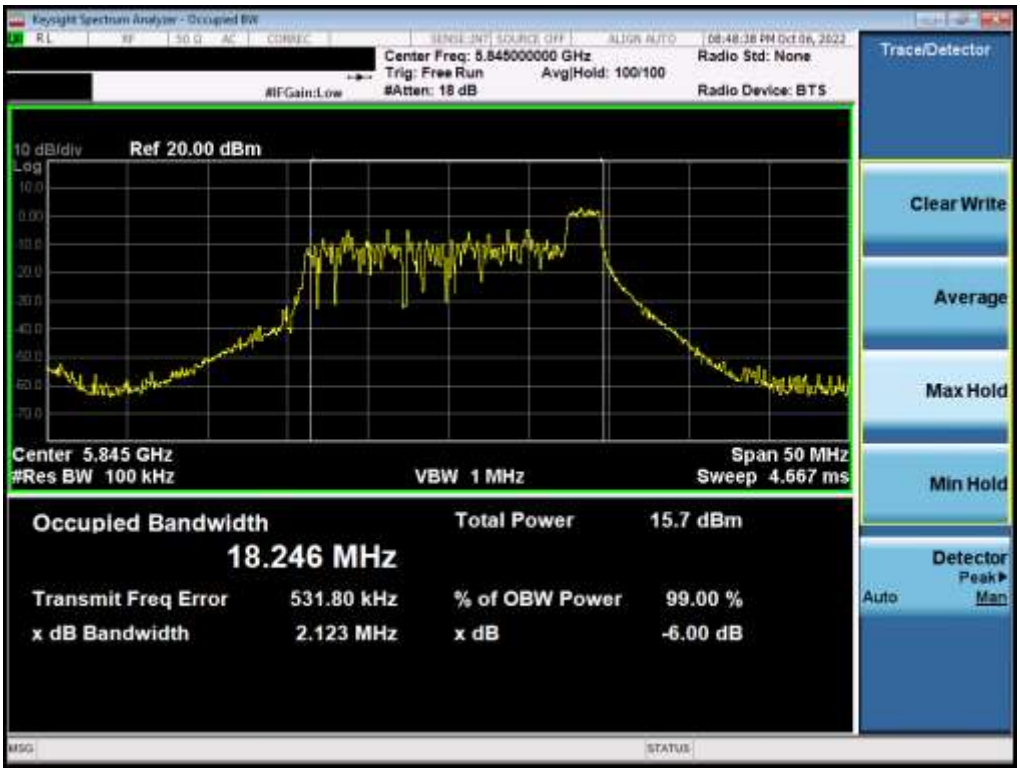
Plot 7-128. 6dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 159)



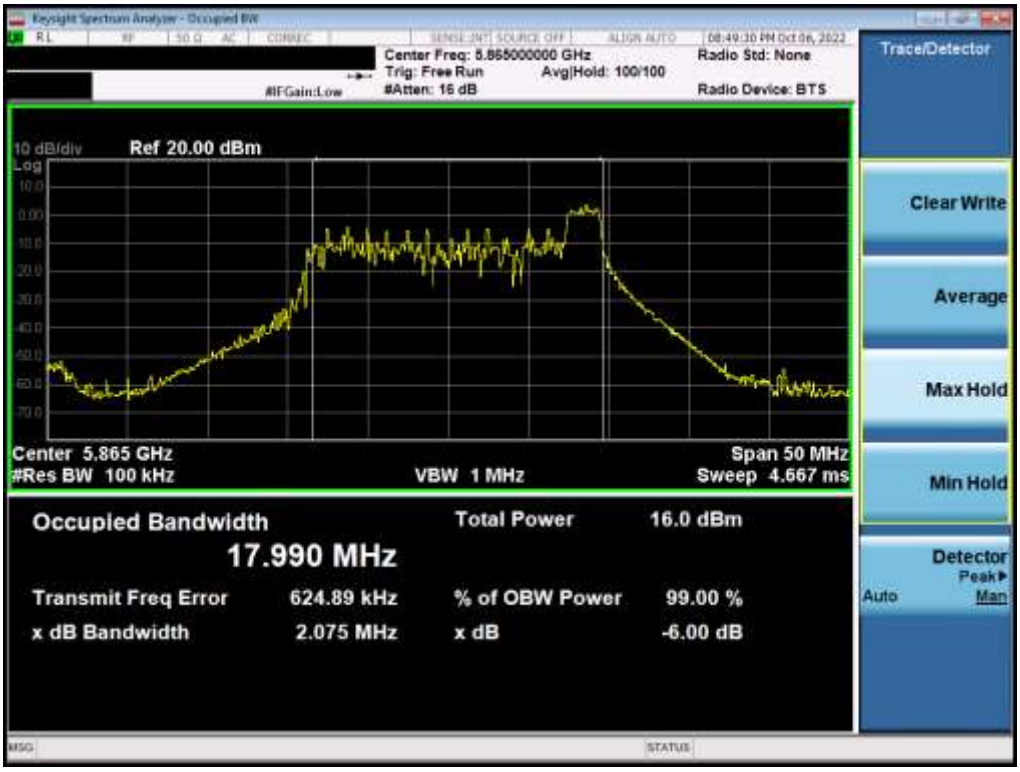
Plot 7-129. 6dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 155)

	Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	Measured 6dB Bandwidth [MHz]
Band 3/4	5845	169	ax (20MHz)	26T	MCS0	2.12
Band 4	5865	173	ax (20MHz)	26T	MCS0	2.08
	5885	177	ax (20MHz)	26T	MCS0	2.07
Band 3/4	5835	167	ax (40MHz)	26T	MCS0	2.17
Band 4	5875	175	ax (40MHz)	26T	MCS0	2.23
Band 3/4	5855	171	ax (80MHz)	26T	MCS0	2.80
	5815	163	ax (160MHz L)	26T	MCS0	3.04
	5815	163	ax (160MHz U)	26T	MCS0	3.09

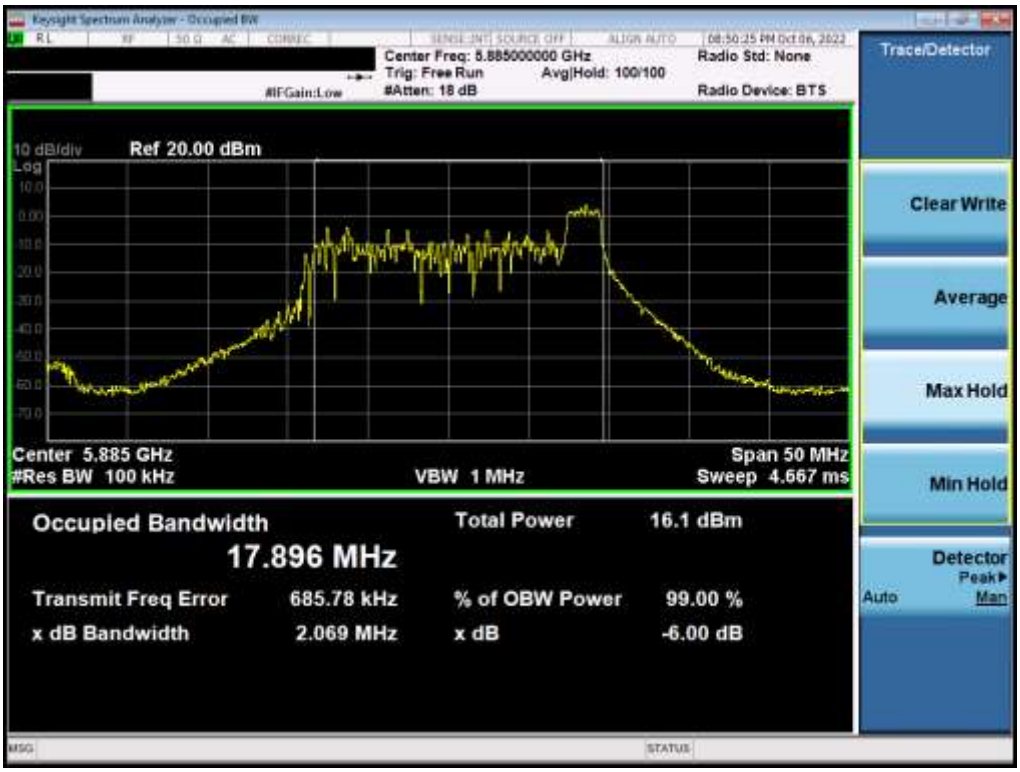
Table 7-11. Conducted Bandwidth Measurements MIMO ANT2 (26 Tones)



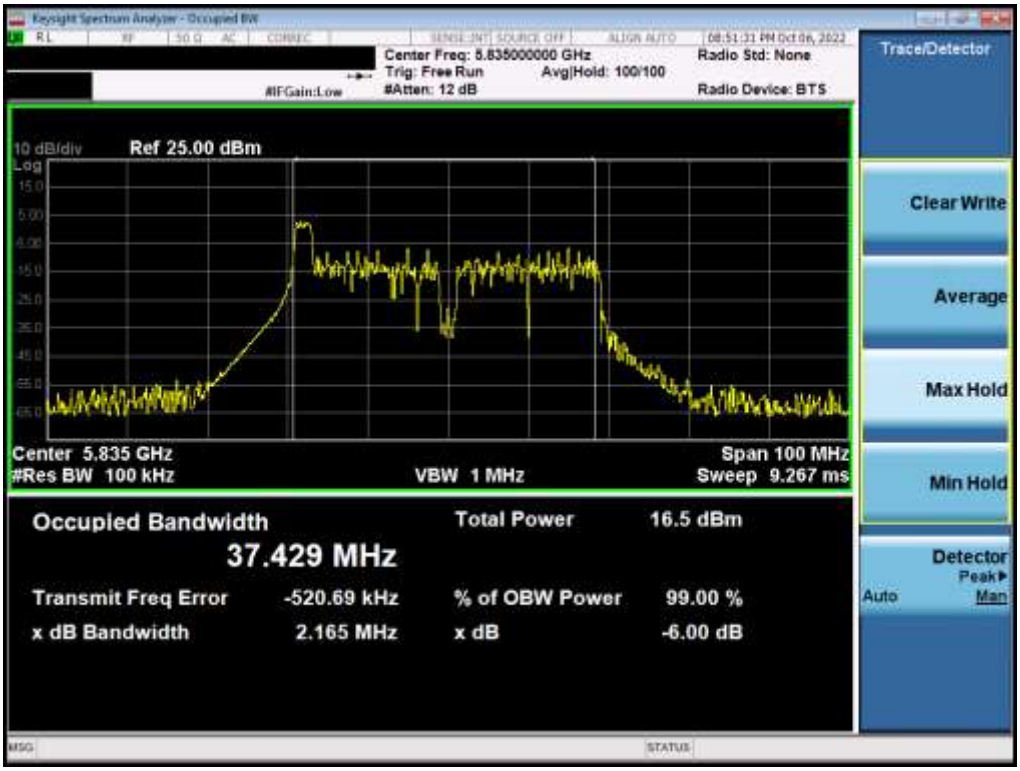
Plot 7-130. 6dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 26 Tones (UNII Band 3/4) – Ch. 169)



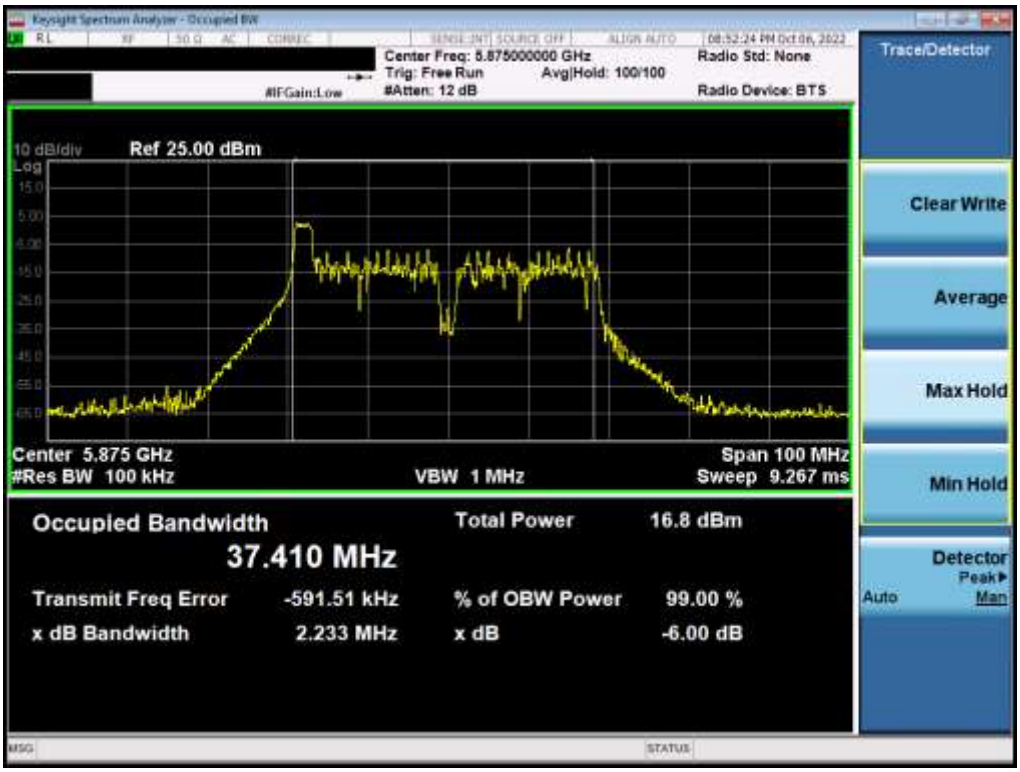
Plot 7-131. 6dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 173)



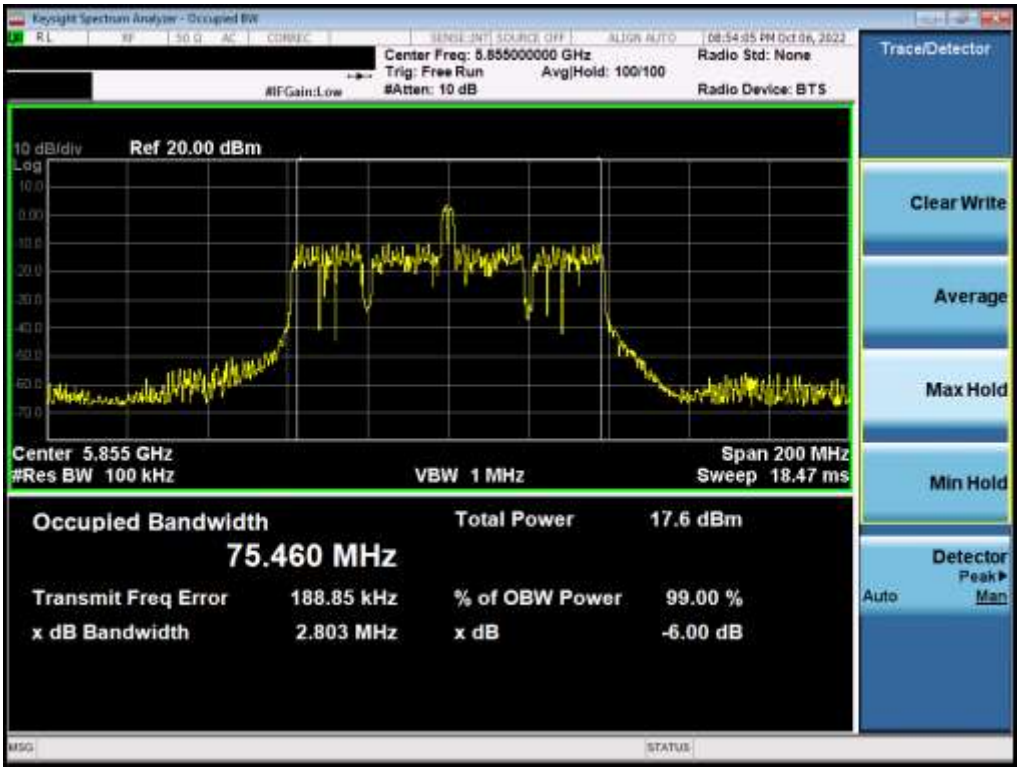
Plot 7-132. 6dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 177)



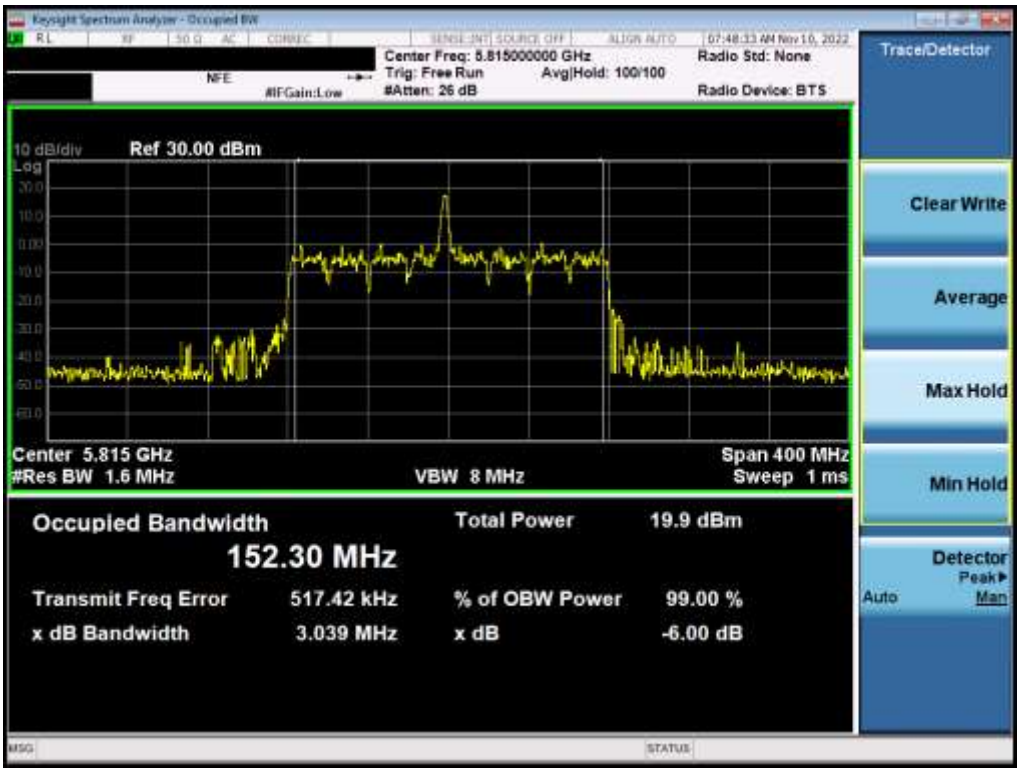
Plot 7-133. 6dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax – 26 Tones (UNII Band 3/4) – Ch. 167)



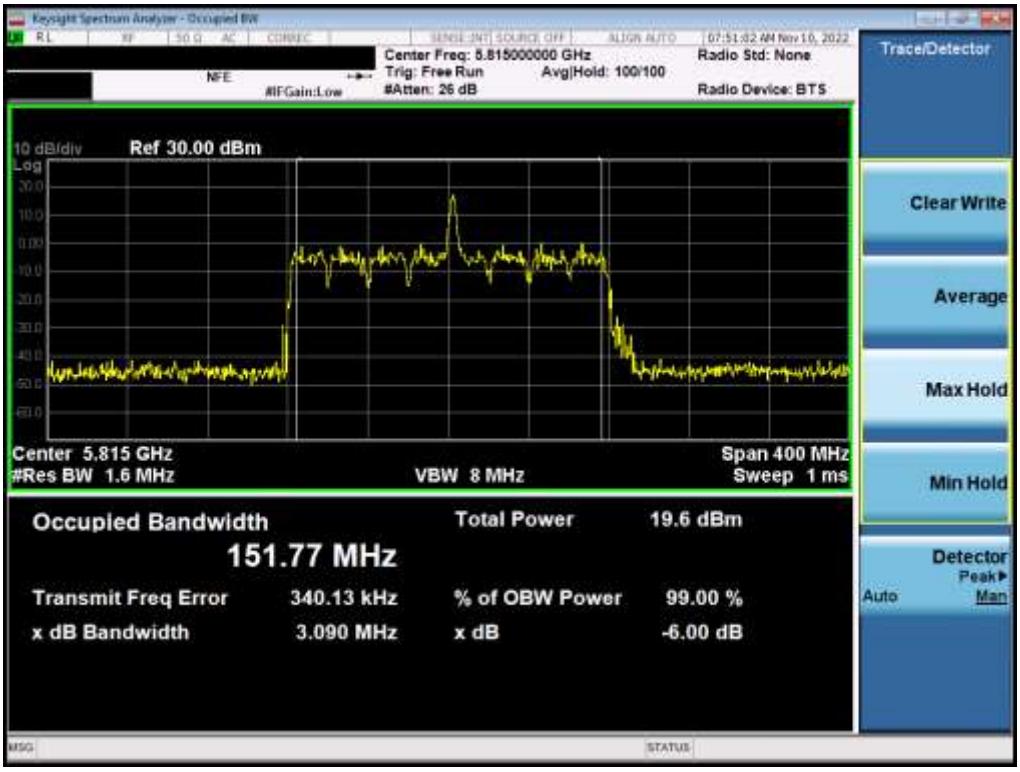
Plot 7-134. 6dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax – 26 Tones (UNII Band 3) – Ch. 175)



Plot 7-135. 6dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11ax – 26 Tones (UNII Band 3/4) – Ch. 171)



Plot 7-136. 6dB Bandwidth Plot MIMO ANT2 (160MHz(L) BW 802.11ax – 26 Tones (UNII Band 3/4) – Ch. 163)

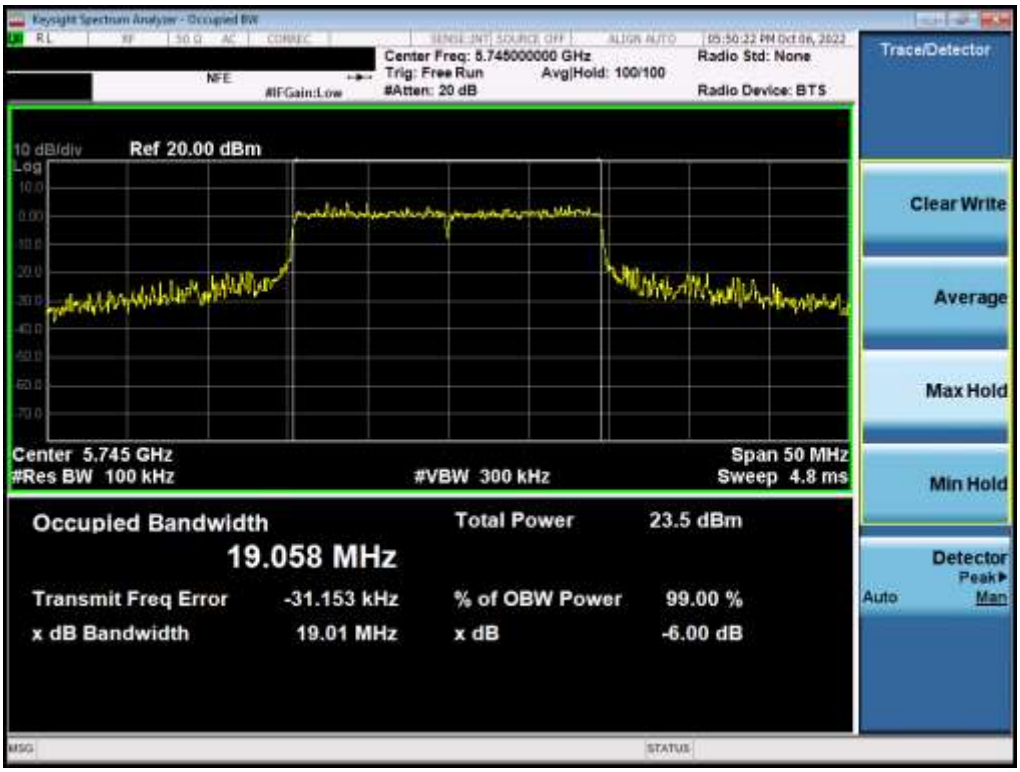


Plot 7-137. 6dB Bandwidth Plot MIMO ANT2 (160MHz(U) BW 802.11ax – 26 Tones (UNII Band 3/4) – Ch. 163)

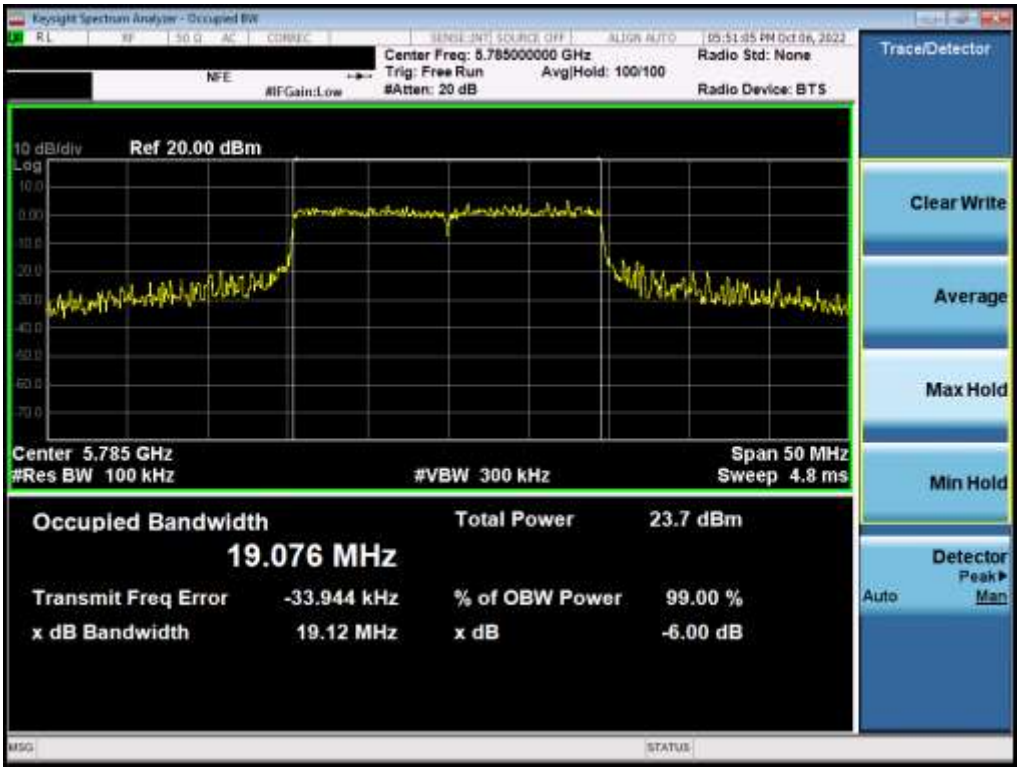
MIMO Antenna-2 6dB Bandwidth Measurements (Full Tones)

	Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	Measured 6dB Bandwidth [MHz]
Band 3	5745	149	ax (20MHz)	242T	MCS0	19.01
	5785	157	ax (20MHz)	242T	MCS0	19.12
	5825	165	ax (20MHz)	242T	MCS0	19.07
	5755	151	ax (40MHz)	484T	MCS0	38.23
	5795	159	ax (40MHz)	484T	MCS0	38.21
	5775	155	ax (80MHz)	996T	MCS0	78.11

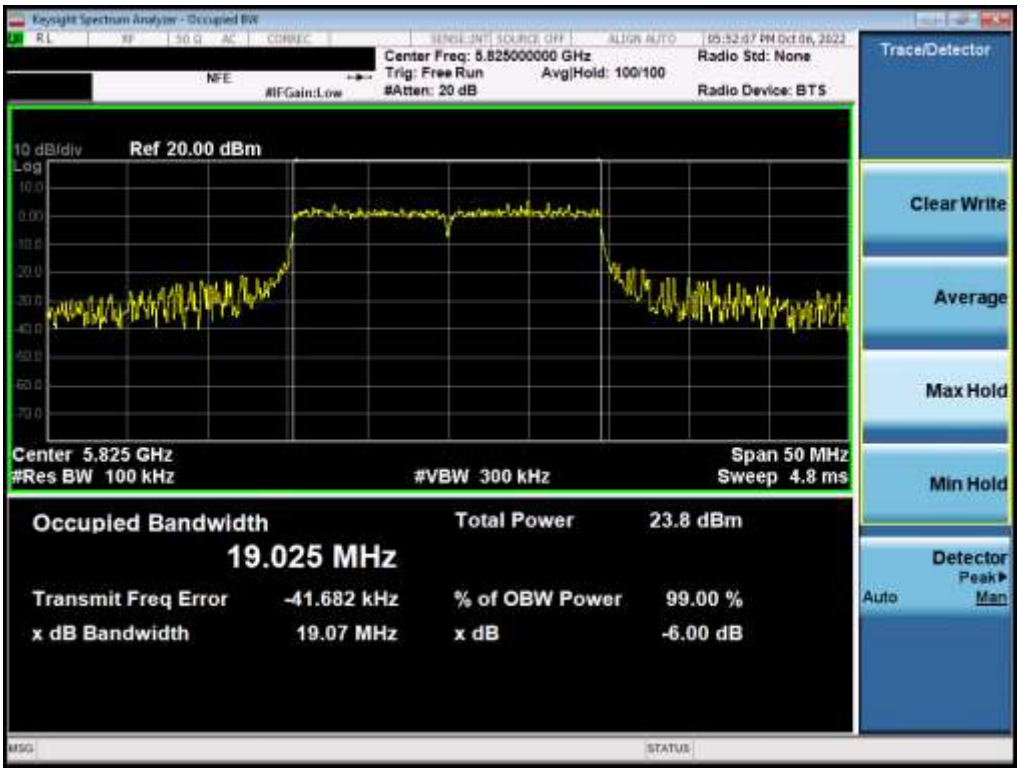
Table 7-12. Conducted Bandwidth Measurements MIMO ANT2 (Full Tones)



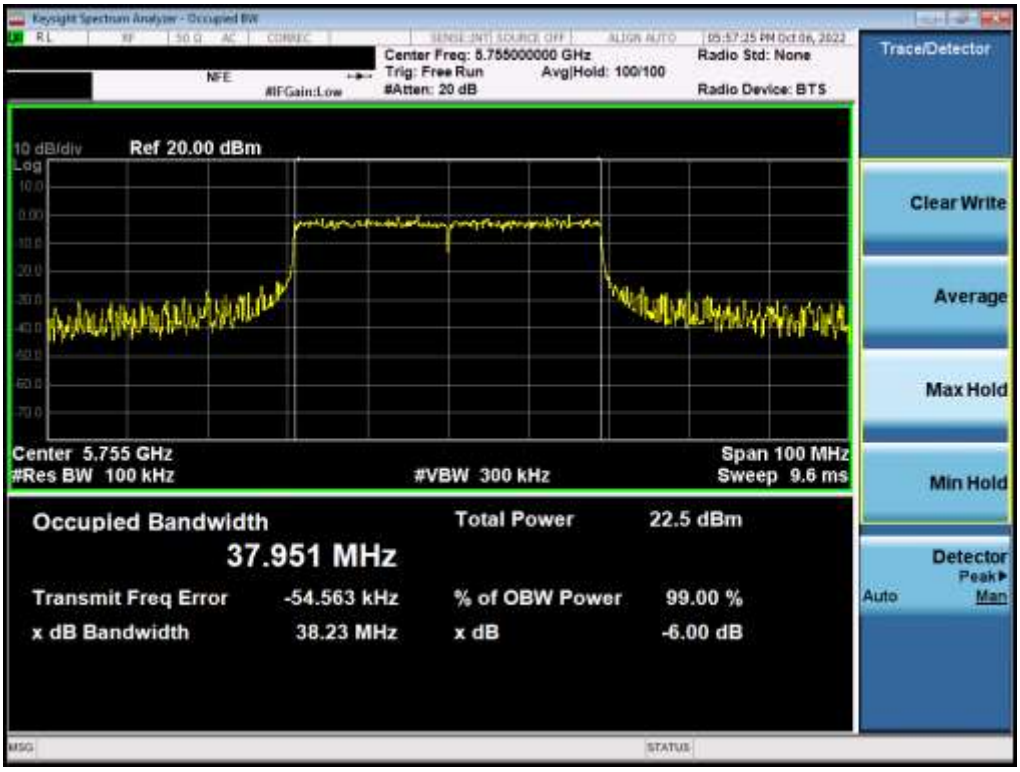
Plot 7-138. 6dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 242 Tones (UNII Band 3) – Ch. 149)



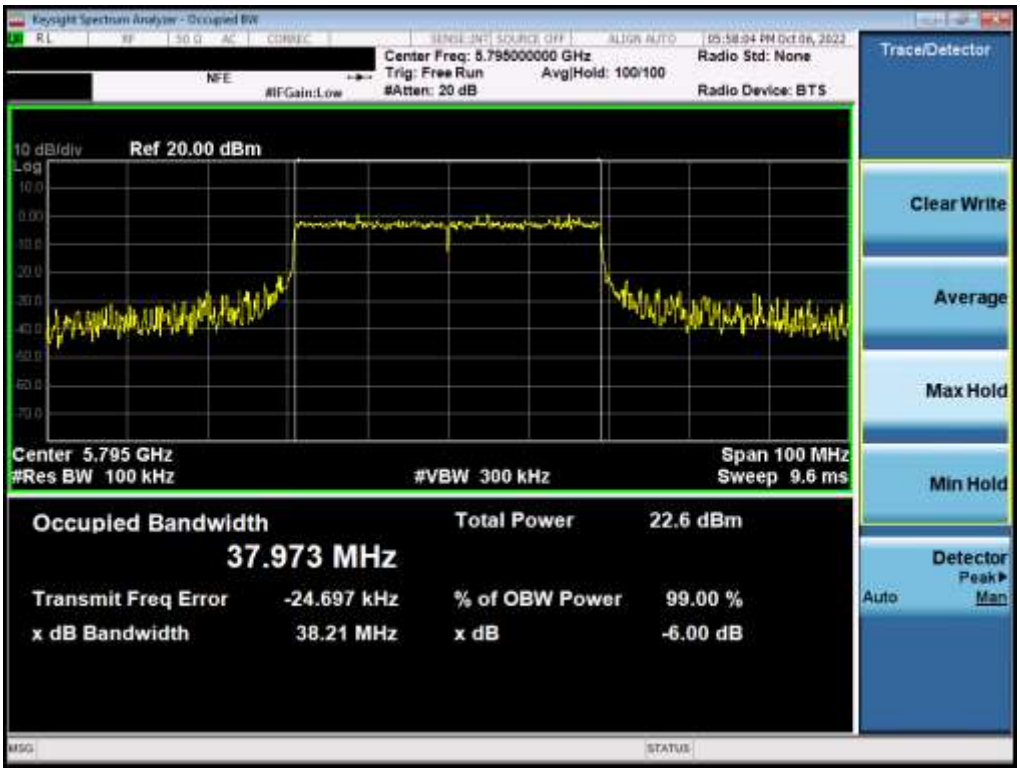
Plot 7-139. 6dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 242 Tones (UNII Band 3) – Ch. 157)



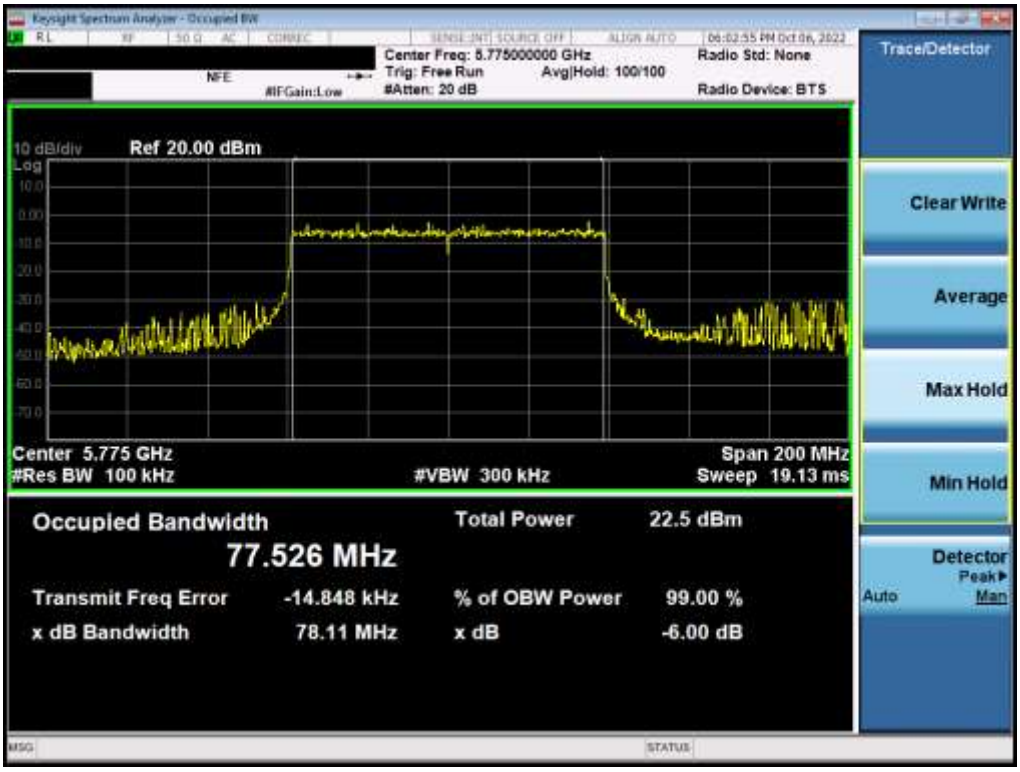
Plot 7-140. 6dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 242 Tones (UNII Band 3) – Ch. 165)



Plot 7-141. 6dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax – 484 Tones (UNII Band 3) – Ch. 151)



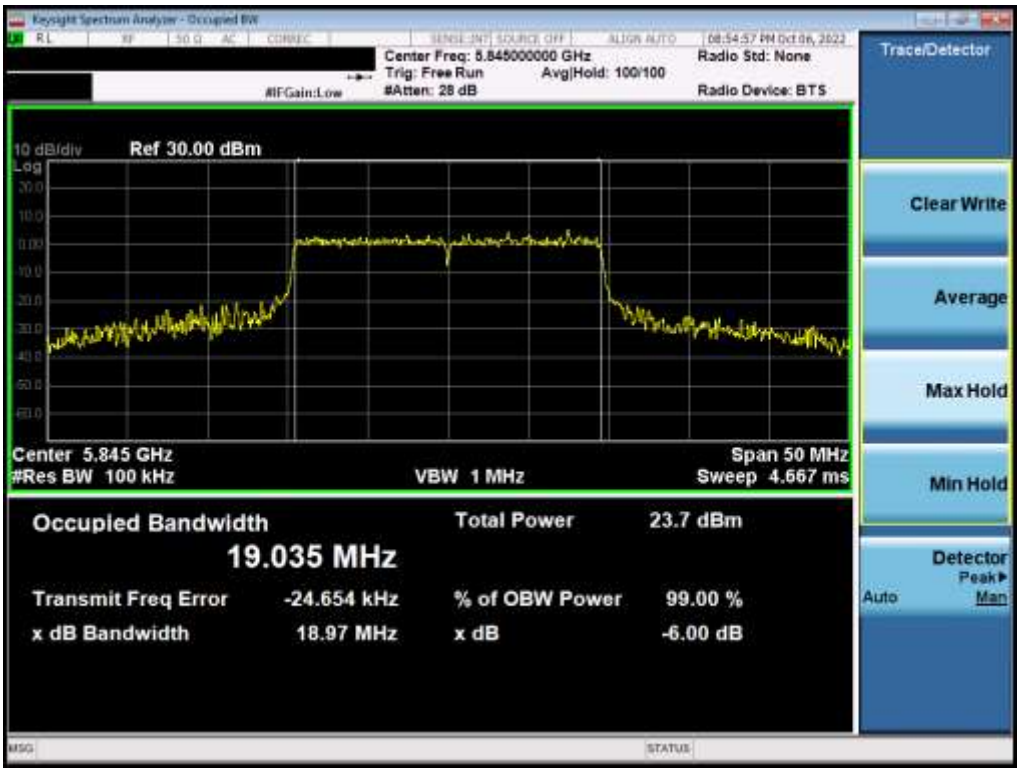
Plot 7-142. 6dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax – 484 Tones (UNII Band 3) – Ch. 159)



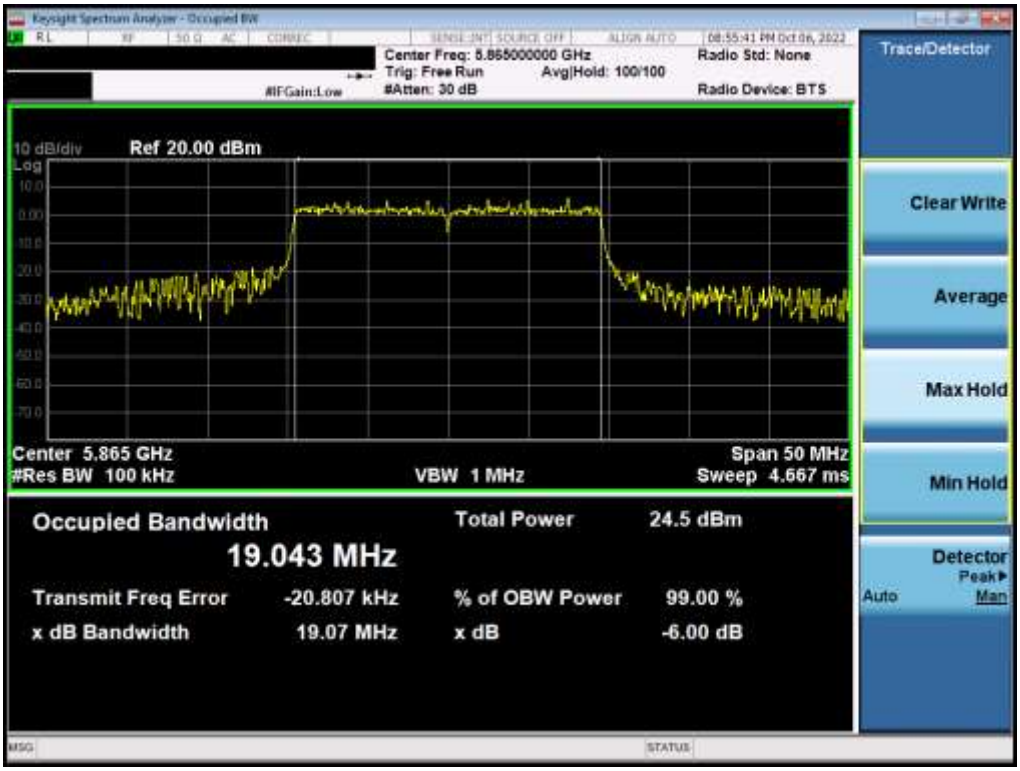
Plot 7-143. 6dB Bandwidth Plot MIMO ANT2 (80MHz BW 802.11ax – 996 Tones (UNII Band 3) – Ch. 155)

	Frequency [MHz]	Channel No.	802.11 Mode	Tones	Data Rate [Mbps]	Measured 6dB Bandwidth [MHz]
Band 3/4	5845	169	ax (20MHz)	242T	MCS0	18.97
Band 4	5865	173	ax (20MHz)	242T	MCS0	19.07
	5885	177	ax (20MHz)	242T	MCS0	19.09
Band 3/4	5835	167	ax (40MHz)	484T	MCS0	38.17
Band 4	5875	175	ax (40MHz)	484T	MCS0	38.12
Band 3/4	5855	171	ax (80MHz)	996T	MCS0	78.16
	5815	163	ax (160MHz)	996T	MCS0	157.80

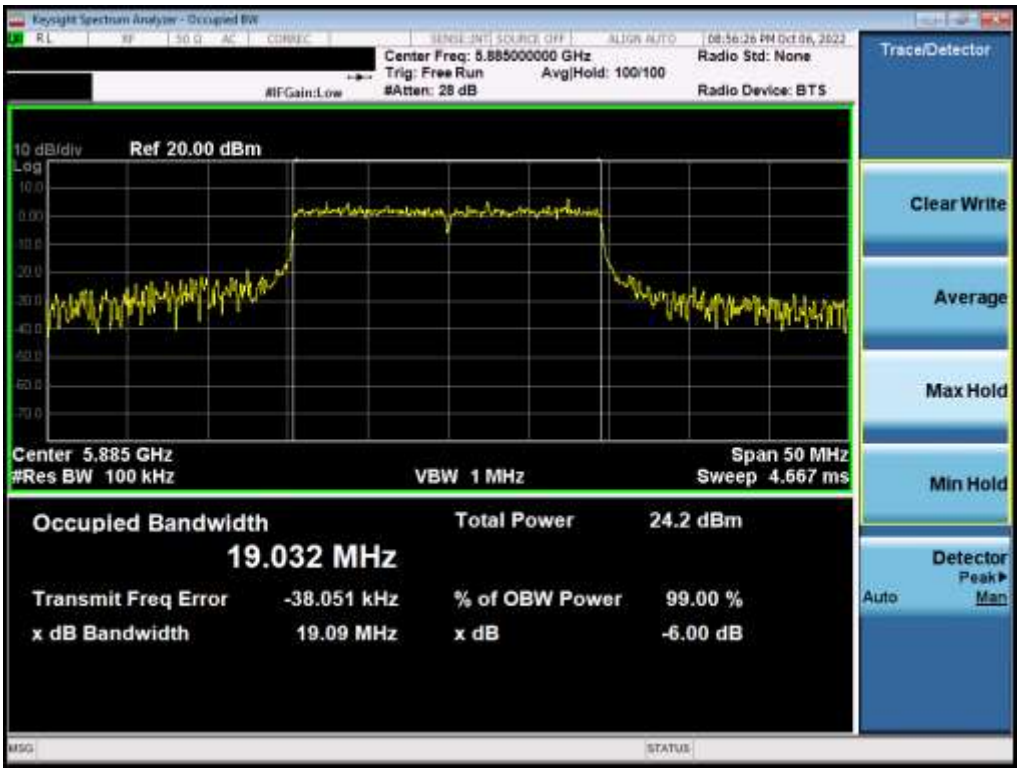
Table 7-13. Conducted Bandwidth Measurements MIMO ANT2 (Full Tones)



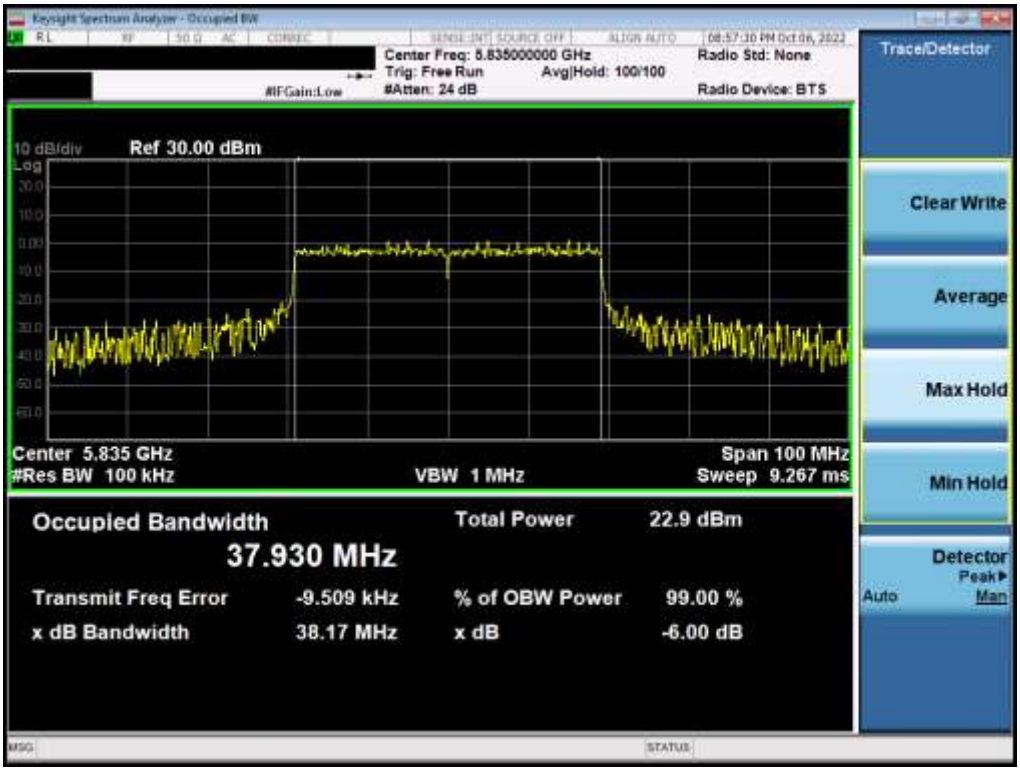
Plot 7-144. 6dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 242 Tones (UNII Band 3/4) – Ch. 169)



Plot 7-145. 6dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 242 Tones (UNII Band 3) – Ch. 173)



Plot 7-146. 6dB Bandwidth Plot MIMO ANT2 (20MHz BW 802.11ax – 242 Tones (UNII Band 3) – Ch. 177)



Plot 7-147. 6dB Bandwidth Plot MIMO ANT2 (40MHz BW 802.11ax – 484 Tones (UNII Band 3/4) – Ch. 167)